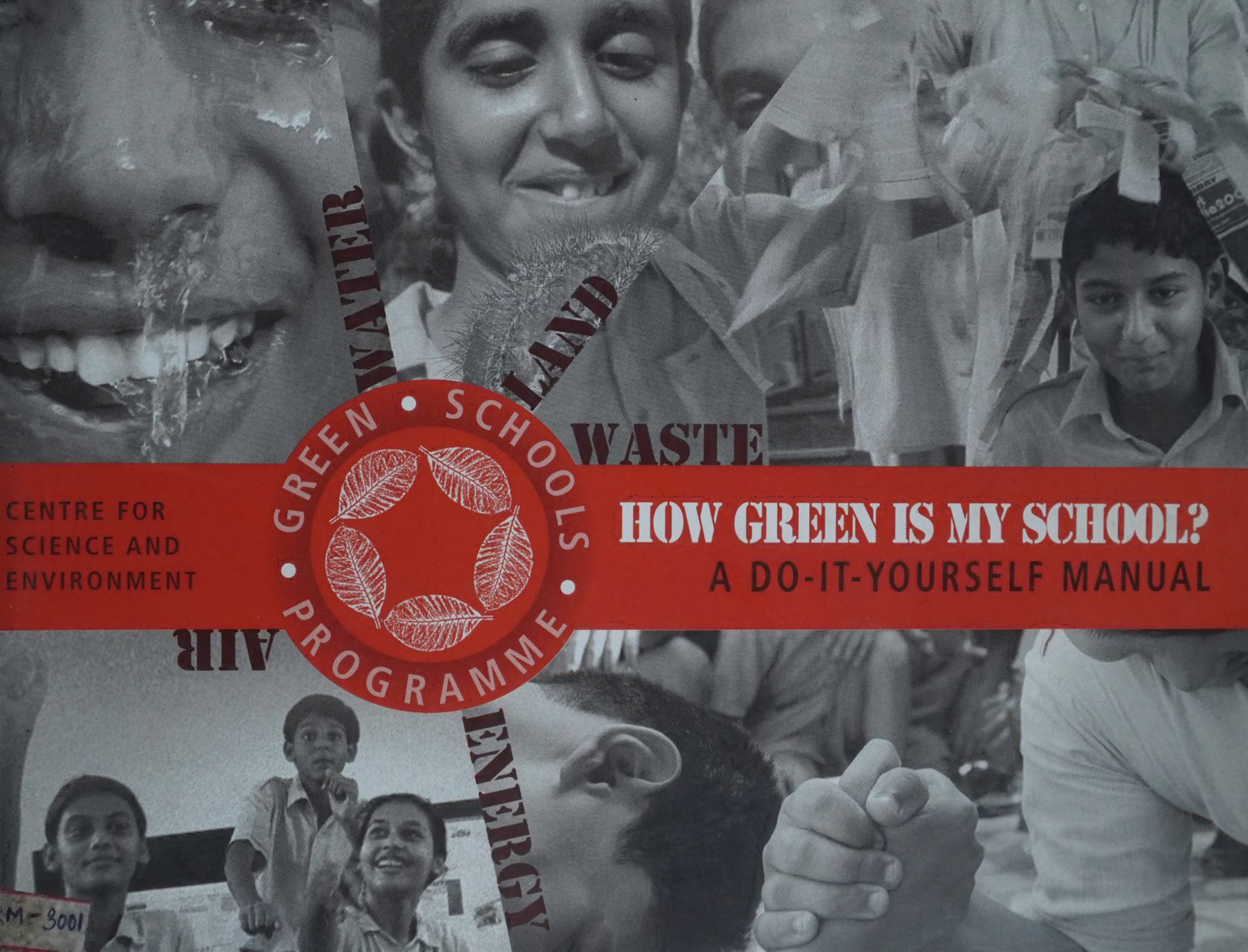
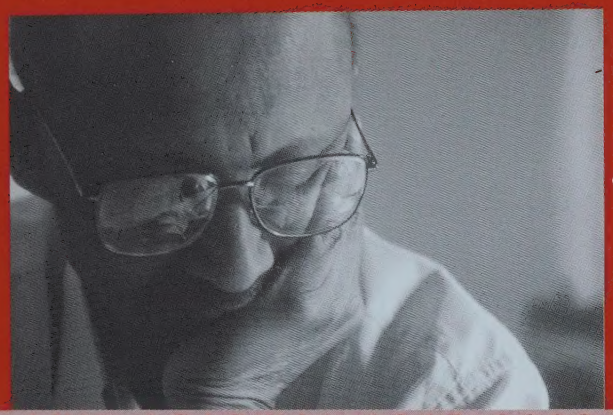


CENTRE FOR SCIENCE AND ENVIRONMENT

HOW GREEN IS MY SCHOOL?

A DO-IT-YOURSELF MANUAL

M-3001



ANIL AGARWAL 1947-2002

"Environmental literature being generated for school children is, with some exceptions, in the genre of nature education. It is very important to expose young children to the beauties and wonders of nature. But as they grow older, it is important they begin to understand how human beings and human societies interact with their environment for their survival and their growth, how these human-nature interactions become a part of a society's culture, and why it is important to rationalise our relationship with our environment."

Anil Agarwal
Founder Director CSE

RS-125

A manual to assess the green performance of your school

CENTRE FOR SCIENCE AND ENVIRONMENT

GREEN SCHOOLS PROGRAMME
A manual to assess the environmental performance of schools

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Preface

We started the Green School Programme with a simple idea.

We know that environmental challenges are growing; we also know that the challenge, however enormous, will need each one of us to get involved. It will need us to change the way we manage natural resources; alter our consumption patterns so that we can do more with less; and innovate with current technologies so that we can improve the environment around us.

We wanted to develop a programme, which would help us learn. Not just the idea but the practice of making change 'work'. We believe that it is always best to learn by doing. It is always best to do by learning.

It is this simple idea we converted into the Green School Programme. The manual provided the tasks for schools to begin the rating of their performance. Each step provided the criterion; its weightage and the method by which we could learn how green we were and how green we could be.

Over the last two years, the idea has gathered momentum. More and more schools across India are using the manual to be a part of this learning exercise. They have learnt that what they know is not enough to protect the environment and what they preach is often not easy to practice. But they have also learnt the rationale of what they should do that will make a difference in the world.

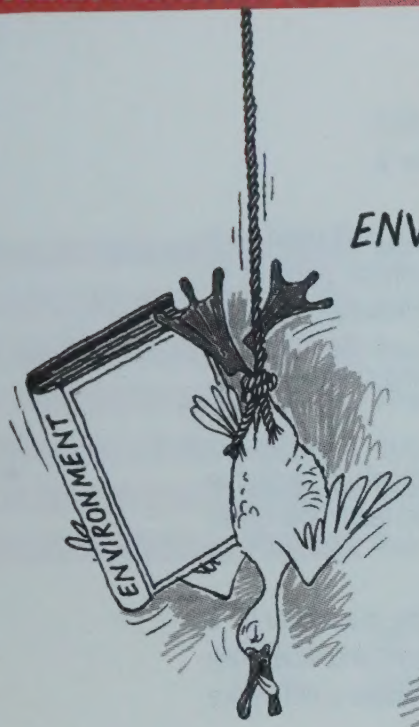
This is the idea in practice. We know people all over the world are learning, to their horror, that they have no idea of what it means to be "sustainable". That in spite of all they did and thought they did, the disaster of climate change is real, and definitely happening. They are realising that combating this global challenge means reinventing what is considered to be good environmental management.

For us, this is not a rating programme for ranks, marks or awards. It is a learning programme for building a new generation of people who are prepared to change the future. Our consumers of tomorrow will have even less of a chance to correct all the mistakes they will inherit from us. We are leaving behind a pretty bad world for them. But we know that they can make a difference if they can distinguish between the different shades of green – believing but not practicing and practicing but not making a difference.

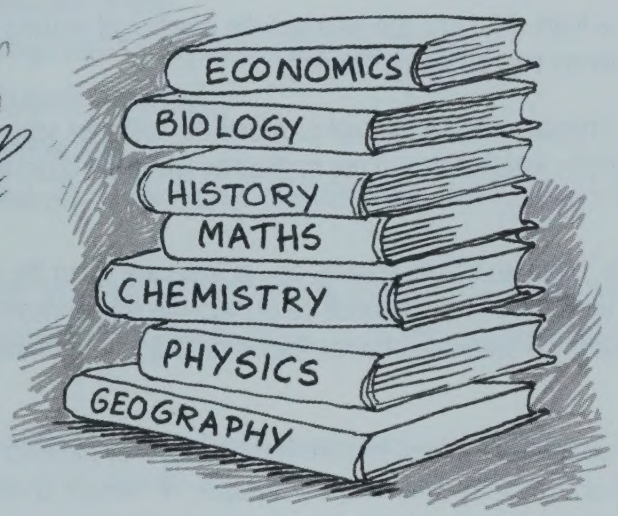
We hope that our idea will work. We hope you will be engaged with us in being the change we believe in.

Sunita Narain
Director, CSE

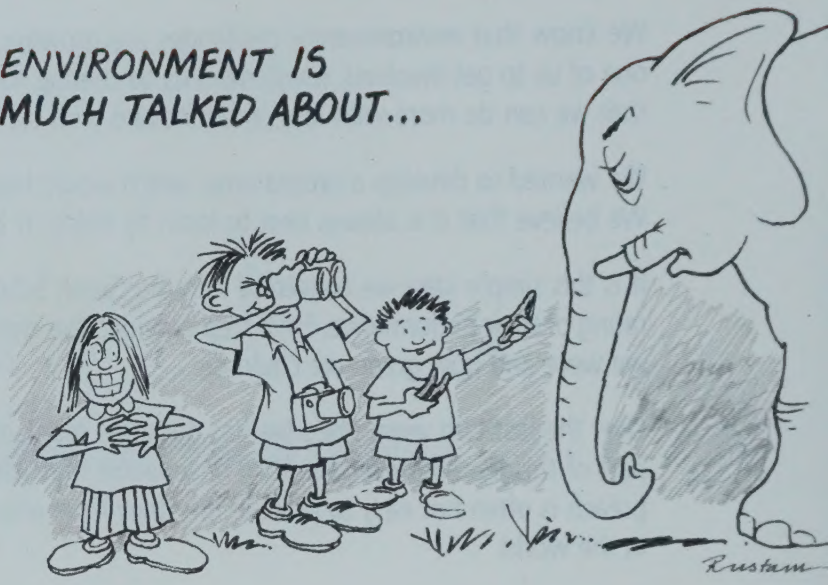
What is environment education?



ENVIRONMENT IN ISOLATION IS A DEAD DUCK!



ENVIRONMENT IS MUCH TALKED ABOUT...



...BUT OFTEN MISUNDERSTOOD!

Environment cannot be taught as just another subject — yet every subject can help us understand it better

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- WATER 05
- AIR 21
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- ACTIVITIES 87

What is the Gobar Times Green Schools Programme?

The field of environment education is dogged by a very fundamental contradiction. While everyone, everywhere, asserts the importance of 'learning to live sustainably,' environment remains a peripheral issue in the formal schooling system. It continues to be viewed more as an extracurricular activity and less as a subject holding a priority position in the national curriculum. This is true not only in India, but worldwide. Fortunately, this has not deterred many talented, creative, and farsighted educators from experimenting, and evolving extremely innovative teaching methods, materials, and practices.

The Gobar Times Green Schools Programme as a relative newcomer, has learnt from all of them. Its novelty lies in the fact that it moves beyond theories and text books, and concentrates solely on '**doing**'. It is designed as a tool to help school communities to audit the use of natural resources within their own premises. It then provides them the methodology to assess themselves as environmental managers. Finally, it tells them how to plug the gaps that they inevitably identify in their current practices.

It is an environmental textbook with a difference. It teaches real lessons.

Why is it important to adopt it?

Adopting the programme may not mean that the most complex technological and scientific problems that the Planet faces today would be fixed instantly. It is too big a task to be completed within a given period of time. But it will certainly stimulate the growth of a more environmentally aware, and responsible generation of citizens. It will equip resourceful teachers to foster environmental literacy. It will help each member of the school community to understand the scope and significance of his or her role in sustainable use of natural resources; to clarify the mission of each major player in the arena of environmental education. And it nudges everyone to get on with the job.

What will it do?

- The Gobar Times Green Schools Programme helps all to move beyond word, jargons, intentions to practices that we believe in. It benchmarks our performance as environmental managers. The audit process uses simple Mathematics to measure impact, and motivates participants to work towards change.
- The monitoring process is participatory and transparent. It encourages students to take up assignments independently and tests their skills of communication and analysis.

- It helps schools to prepare an inventory of their resources and systematically collect information about their environmental performance.
- The analysis of this information can be used by a network of schools, or by city or state governments to do comparative evaluation so that the best practices can be disseminated for all to learn.
- It equips school authorities to manage their own resources better. In the process, it paves the way for better government policies.

What are its key elements?

GSP is a self-assessment programme. It helps schools audit their use of resources and map their consumption and wastage. The exercise involves collection of information under the following heads:

Water, which builds an understanding of water use, on the sources of water, on the ways of water conservation (rainwater harvesting and water recycling), the importance of sanitation facilities, with the ultimate aim of building a water literate and prudent society.

Air, which helps schools understand how their transport policies affect air quality and to find ways of reducing their emissions so that a citizen's right to clean air is protected.

Land, which focuses on the land-use of schools to map green areas, to identify biodiversity; and to grasp the enormous ecological and economic value of this resource.

Energy audits the sources of energy, the consumption of energy; and explores ways in which this resource can be saved, to minimise pollution and costs.

Waste, helps in finding out the total amount of waste that is generated, and offers ways and means to reduce it by segregation, recycling and reuse.

Our network and your school

Join the network

Even before you start the audit process, join the Gobar Times Green Schools network. It is a conglomeration of schools which are practicing GSP. Joining the network will enable your school to be in touch with all other schools across the country. You will also have immediate access to CSE's Environment Education Unit, in case you require any help in doing the audit. Every school conducting the audit is eligible to be a member of the network – just by registering itself onCSE's website.

http://www.cseindia.org/programme/eeu/html/index.asp

You will have to fill up a simple form and choose a username and password. You can use the same to log in everytime you visit the website. You can also send all your data online by filling up the forms given on the website. You get access to the monthly Activity Sheets and various other resource materials on environment education by becoming a member. Also do read about the latest developments on the Network front in Gobar Times, our monthly magazine for beginners. Visit www.gobartimes.org

Formation of audit teams

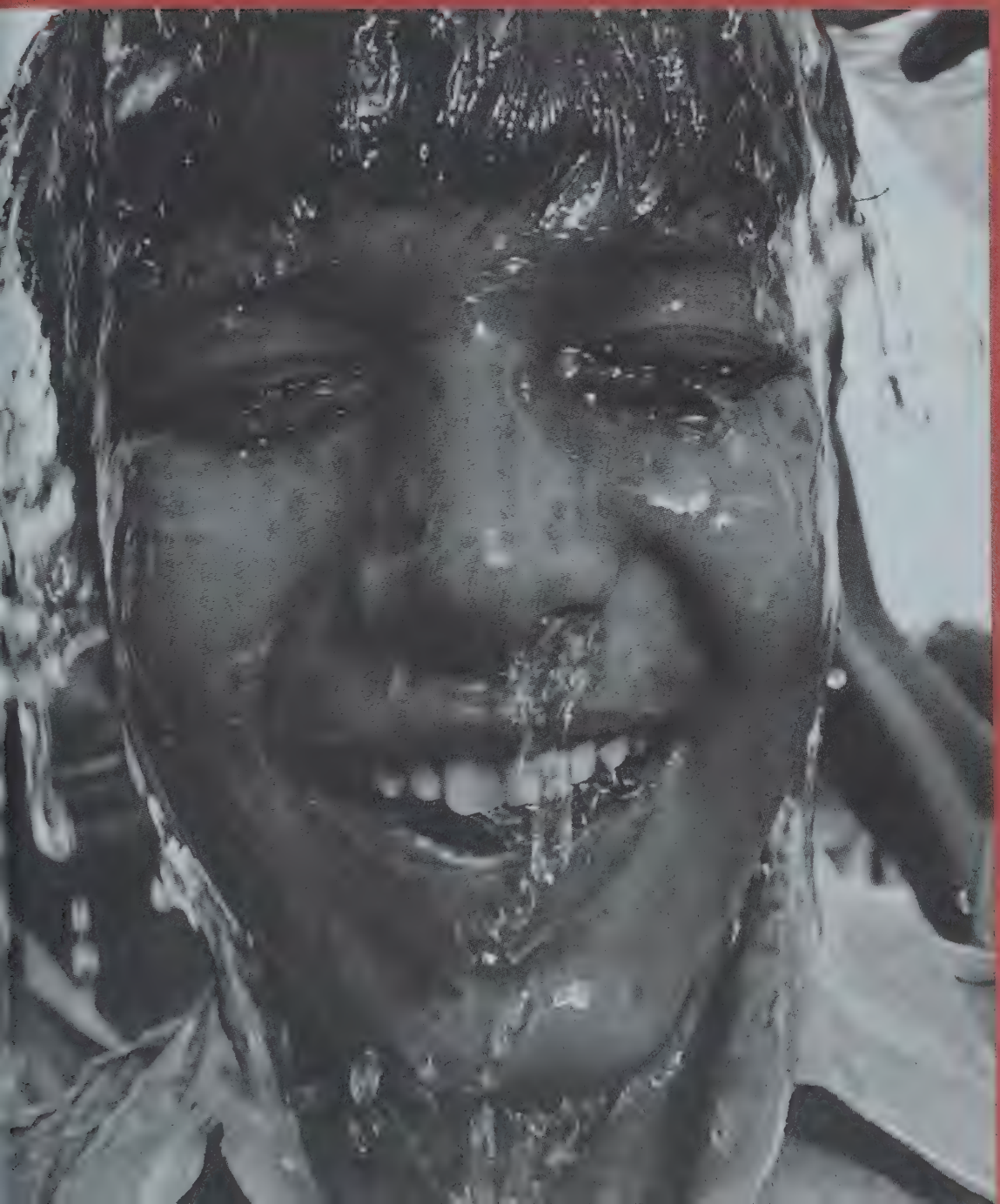
The first step of the programme is setting up of audit teams or teams which would assess or audit the school's environmental practices. Seperate teams can be formed for the five components of the Programme. An ideal team would be a mixture of 5-10 students, one teacher coordinator, and administrative staff, whose help you would require in doing the audit. All the audit work will have to be done by the students, while teachers and other staff will act as advisors and facilitators.

Learn and teach

Once the audit teams are identified and every member is clear about his or her role, arrange a GSP Flag off ceremony. Here the entire school community engaged in the programme meets and discusses the plans.

- Let each audit team explain – what is its agenda and what are the actvities planned? How are they going to be conducted?
- Introduce the administrative and support staff to the students and vice-versa
- Invite the Principal for the ceremony.

This way, you need not waste time answering queries everytime you embark on an activity. Everyone will be aware of the programme and its agenda. They will learn as you learn.



water

Make your school water literate

How much water does the school consume?

Are the sanitation facilities in your school adequate?

Has your school set up systems and practices to conserve water?

How much water does your school harvest?

How much water does your school recycle?

India: water literate... by tradition

Right to water is actually right to life and livelihood. Just as we cannot live without drinking it, a nation cannot survive if it is water stressed. This resource determines a country's future, acting as a driving force behind its economic growth. Farmers-big and small; industrialists, professionals and traders in every field need water to exist and prosper.

Our ancestors realised the importance of managing water wisely much ahead of the rest of the civilised societies. In India it was critical to get the water equation absolutely right. Why? Because rainfall in India is seasonal. In most parts of our country it rains for about 100 hours in a year. And our lands are made of hilly terrains or large tracts of arid plains or heavily flood-prone regions. A huge amount of rainwater flows off unused during the monsoon and once the season ends, the land becomes dry. So the people who first inhabited the Indian subcontinent learnt that they needed a very finely balanced system of water supply and distribution to run a healthy economy.

And that rainfall had to be captured where it fell...locally.

They prospered. Throughout the first millennium, India was the richest country in the world...and the Europeans were making desperate attempts to reach its shores.

Who owned water then? Well, the kings knew that agricultural prosperity would earn them revenue. So they built tanks, wells and canals. But they encouraged local communities – ordinary people – to manage the structures. Every village functioned like a little republic. The village assembly set down rules for sharing and distributing water, and also had the authority to punish anyone who dared to defy. History proves that very efficient local water management systems were set up in various parts of India in as early as the 4th century BC.

British raj...taking control

Then came the colonisers. In 1858 the British Crown took up the reins of control. The sole aim of the rulers was to increase revenue. So they stripped the village institutions off their authority to manage local resources. They imposed huge land taxes, even during droughts. And the villagers struggling to pay off could no longer raise funds to maintain the ponds, wells and canals. The government with its gigantic network of officials took control over the land. And the water.

The desi babus

The foreign rulers destroyed India's ancient water tradition. The native babus who took charge after Independence did nothing to restore it. In fact, they did everything to ensure that water remained under the control of the government authorities. The mantra of the era was 'big dams-the temples of modern India'.

The basic idea is to store, check and regulate the flow of our numerous rivers by building gigantic, concrete structures on them. And big money has been spent on these big dams.

So was that a total waste? Of course not…we needed them to cater to India's growing millions – no billions! The problem was that the government put in all its attention and money in these humungous engineering projects…and forgot all about the home-grown, traditional systems of water management.

Forgetting the small – a big mistake!

Now that was a major mistake. Why? Take a look at these facts:

In 1955, an Indian citizen had about 5000 cubic metres of water per year at her disposal for use. Today she has less than 1500 cubic metres. And the share is depleting everyday.

Inspite of the crores being spent on big dams and irrigation structures, more than 40 per cent of our farmers depend on the monsoons to water their land. So each drought destroys the rural communities ability to cope.

Even today, the government admits to 'not being able to provide' safe drinking water to more than half of the country's population. Poor sanitation and unsafe drinking water account for a substantial part of the disease burden in India, contributing to diarrhoea, cholera, typhoid, and jaundice.

But the key issue of water is not about scarcity. It is about careful use and fair and equal distribution among the users.

The real water crisis India faces today is not about scarcity per se but about managing these competing needs, which are now erupting into conflicts among users, often turning violent

Cities vs villages

The fact is that urban areas and industrial centres in India are now sucking up much, much more than their legitimate share, and putting tremendous pressure on water resources. Cities across the country need more water for their growing population, and more importantly, their growing affluence. So they are sourcing it from further and further away. Delhi for instance, is getting water from Tehri dam, over 300 km away in the Himalayas; Bangalore from the Cauvery, about 100 km away. Every city is getting thirstier by the day. The problem is that they are encroaching upon the territories of the rural population. The real water crisis India faces today is not about scarcity per se but about managing these competing needs, which are now erupting into conflicts among users, often turning violent. When Chennai decided to tap the Veeranam lake for drinking water, farmers living around the lake who use it as main supply source, took to streets.

Ground reality

But hey! Let's do a reality check here. Surely, no one can do without his or her share of water...even for a day! If the government cannot supply enough, where are the householders, industrialists, farmers, getting their quota from?

The answer is groundwater. Did you know that India is among the largest exploiters of groundwater? Out of the 200 cubic kilometres of groundwater drawn globally every year, India extracts more than 66 per cent!

Rivers: Drowned in waste

Most cities rely heavily on rivers to meet their water needs. According to official figures, more than 80 per cent of Delhi's water comes from Yamuna; a large portion of Hyderbad's from Krishna. These cities guzzle water and in return give the rivers their excreta. As population grows, waste discharge shoots up. Rivers, of course, have the capacity to cleanse themselves, diluting waste with flow of fresh water. But with more and more fresh water being sucked out, and being replaced by effluents, the rivers are literally being choked to death.

Result? More than two-thirds of our country today can be divided into two zones: groundwater scarce zone and acutely groundwater scarce zone. But what is more shocking is that we have very little idea about who is using all this water and exactly how much…The consumers can be divided under three heads – domestic, industrial, and agricultural. The government does track their rate of consumption – but the figures that it comes up with just do not look real. See for yourself...

At home and dry…

Government says householders use just five percent of the total groundwater extracted. But in reality at least 76 per cent of rural households and more than 21 per cent of urban families are completely dependent on groundwater. And it is estimated that roughly 80 to 90 per cent of drinking water is from groundwater sources.

Industry – the giants

This is the fastest growing area in our economy and also the largest user. But do the government records reflect that? Nah…

The industrial sector has 30 per cent growth in the five years from 1993 to 1998. But the percentage of groundwater set aside for it by the government remains exactly the same as it was in 1992.

Agriculture-bound to the ground

Certainly the most crucial sector. Not only because it provides livelihood to almost 70 per cent of India's population. But because today, 62.4 million hectare, accounting for 75 to 80 per cent of the total land under irrigation, is sustained by groundwater.

So what do we do?

Learn from the past: Some of the answers to this crisis lie in our traditions, in the hands of our people, and at a pretty low cost. In the past water was managed locally. Administrative units made of local people decided how it would be shared and distributed, and penalised the over-users and usurpers. The system ensured fair and equitable access to the resource and a stable economy. So it is time to remodel the present centralised management system.

Taking responsibilities: We need to be competent, conscientious and committed water citizen ourselves. But if we are to attain our right over water, we have to take up some responsibilities ourselves. GSP is the first step towards this.

Mission GSP

The programme helps the school community to get familiar with its water. The audit establishes the current consumption levels and practices of the school in context of water use, disposal and reuse.

In the long run the audit reports become a repository of data that helps develop a profile of the school community vis-a-vis issues related to water.

WATER

Water is the first parameter that we will be auditing. We will look into the following aspects:

TASK 1 Choose your water audit team

TASK 2 How much water does your school use?

TASK 3 Are the sanitation facilities in your school adequate?

TASK 4 Does your school follow water conservation practices?

TASK 5 How much rainwater does your school harvest?

TASK 6 How much water does your school recycle?

TASK 7 Your school's initiatives

TASK 8 Final score

The scoring system given along with every task will help you in rating your school.

TASK 1 Choose your water audit team

- Before you start you must get together a team. An ideal team would consist of one teacher (science or social science) to guide you during the audit. You would also require the help of the administrative staff of your school and other staff like plumber, electrician and other maintenance staff. And most importantly 5 to 10 of your schoolmates.

School : _____

Teacher: _____

Administrative staff: _____

Students: _____

_____ Date: _____

Working together is fun and it is an opportunity to get to know people.

TASK 2 How much water does your school use?

Make sure that the school's overhead tanks are completely full in the morning, then check status in the evening to assess daily water consumption

Calculate how long it takes to fill a 30 litre bucket. Then find out how long the pump runs per day, to calculate groundwater used.

To come up with a plan to save water, it is important to know how much water is the school actually using. To find out the total amount of water consumed, use the following methodology:

HOW TO COLLECT DATA:

- If the school's water meter is monitored regularly and, therefore, bills record actual amount used, then students can simply compile bills to assess total consumption.
- If the bills are irregular and incorrect, then monitor the overhead tanks. Ensure that the tanks are full when the day begins. Check water level when school gets over. Estimate consumption.
- If your school uses groundwater, take a bucket, and measure its exact volume by borrowing beakers from the laboratory. Then switch on the underground water pump. Let the water run out of the hose pipe into the bucket. Check the time it takes to fill up the bucket. You can now calculate the flow of water in litres per minute. Find out (from the gardener or other administrative staff) the number of hours the pump motor run per day. Multiply the number of hours the motor is run by 60 to get number of minutes the motor runs. Then multiply the number of minutes the motor is run by how much water comes out from the hose pipe in a minute.

The administrative staff and the plumber would be helpful in doing all the above. Conduct an audit for two or three days and then take an average to find the total consumption.

Total consumption per day = _____

Once you have found out the total consumption, find out the per capita consumption using the formula given below:

Per capita consumption = Amount of water consumed (b) / Total strength (a)

a. Total strength of your school is:

_____ (Students) + _____ (Teachers) + _____ (Administrative staff) + _____ (Other staff) = _____ (Total Strength)

Given below are the national averages of consumption for different categories of schools.

TABLE 1. Averages-consumption of water *

	Day scholar school	Day boarding school	Residential school
Average consumption	13-17	17-23	125-135

TABLE 2: Fill in quantity of water consumed*

_____

Litres Per Capita/Per day(LPCD)

* Total quantity of water used in litres per day (LPD)

WATER USE: CALCULATE YOUR POINTS

If the consumption of your school is between 13 to 17 LPCD (Day scholar school), 17 to 23 LPCD (Day boarding school) or 125 to 135 LPCD (Residential school) your school gets 15 points.

Deduct 1.5 from 15 (maximum points) for every litre consumed over 17 and below 13 LPCD (Day scholar school).

Deduct 1.5 from 15 (maximum points) for every litre consumed over 23 and below 17 LPCD (Day boarding school).

Deduct 1.5 from 15 (maximum points) for every litre consumed over 135 and below 125 LPCD (Residential school).

The points scored for use of water are = _____.

There are about 6,00,000 primary schools in rural India. Only ten per cent of these have adequate toilets and urinals.

TASK 3 Are the sanitation facilities in your school adequate?

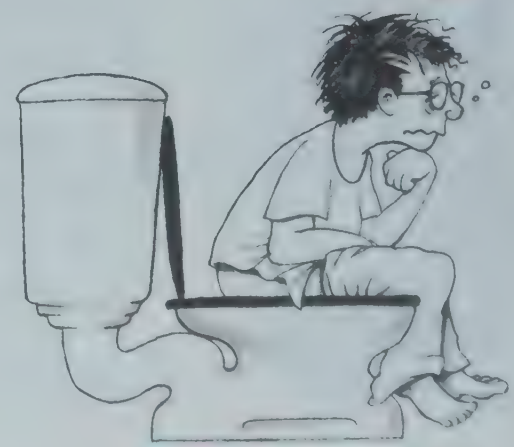
Hygiene and sanitation facilities are vitally important for a child's health. Lack of these hampers attendance, especiallly of girls in senior grades.

TO COLLECT DATA: Count the total number of water closets, urinal pots/slots, drinking water taps and ablution taps you have in school. Divide it by the total strength of the school to find out what is the load per unit for each facility. Compare it to the Evolved Standards for sanitation facility given in Table 4, page 12. Using the formula given calculate your points.

Extract from IS:8827 - 1978 published by Indian Standards Institute

TABLE 3. Sanitary fittings for schools

Fitments	Pre-schools	Primary & Secondary schools (Boys)	Primary & Secondary schools (Girls)	Staff
Water closets	1 per 15 students or part thereof	1 per 40 students or part thereof	1 per 25 students or part thereof	1 per 30 members of staff or part thereof
Urinals	Not specified	1 per 20 students or part thereof	Squatting plate urinals 1 per 20 students or part thereof	Not specified
Drinking water fountains	1 per every 50 students or part thereof	1 per every 50 students or part thereof	1 per every 50 students or part thereof	1 per every 50 or part thereof
Ablution taps	1 in each water closet and 1 water tap with draining arrangements shall be provided for every 50 students or part thereof in the vicinity of water closets and urinals.			



The Indian Standards Institute (ISI) has laid down guidelines for adequate sanitary facility (Table 3). Based on these ISI standards we have Evolved Standards (Table 4) that will be more practicable for the schools to follow.

TABLE 4. Evolved standards of load per unit

School	Fitment			
	Load per water closet	Load per urinal	Load per drinking water tap	Load per ablution tap
Day scholar	45 people	50 people	50 people	50 people
Day boarding	35 people	40 people	50 people	50 people
Residential	25 people	30 people	50 people	50 people

Girl students often stop drinking water in schools to avoid using unhygienic sanitation facilities. This affects their mental and physical health as well as their academic performance.

If schools lack separate facilities for girls and boys, many girls do not use toilets and many do not attend school during menstruation.

Identify the number of students in the school _____

Identify the number of staff in your school _____

Identify the number of following items in your school:

- Water closets _____
- Urinals _____
- Drinking water fountains _____
- Ablution taps _____

Apply the given formula to derive the load per unit:

- Total strength of the school / Number of water closets _____
- Total strength of the school / Number of urinals _____
- Total strength of the school / Number of drinking water fountains _____
- Total strength of the school / Number of Ablution taps _____

If your school provides the above facilities as per the specifications given above or the load per unit is lower than the specifications of Indian Standards Institute then it gets full 20 points.

If the load per unit is higher than than the specifications follow the method given below to calculate your points:

SANITATION: CALCULATE YOUR POINTS

- Water closets = Load per water closet / existing load per water closet x 100 x .05 +
- Urinals = Load per urinal / existing load per urinal x 100 x .05 +
- Drinking water tap = Load per driking water tap / existing load per drinking water tap x 100 x .025 +
- Ablution taps = Load per tap / existing load per tap x 100 x .025 = your points in sanitation section.

If your school has less load than Evolved Standards, your school gets full points.

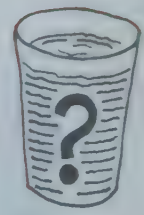
TASK 4 Has your school adopted water conservation practices?

A substantial amount of water can be saved and then used for other purposes if some simple precautionary measures, at minimal costs, are taken to prevent wastage. Listed below are a few you can begin with.

Tick (✓) the practices your school follows:

- ☐ Install float valves in all tanks to stop overflow.
- ☐ Plug leakages in water pipelines and taps in the school.
- ☐ Install drop taps at all outlets.
- ☐ Set up drip or sprinkler irrigation systems in school.
- ☐ Put dual flushes for all water closets or alternative flush system.
- ☐ Keep hand wash/soap near ablution taps.
- ☐ Ensure toilets are cleaned 4-6 times a day.
- ☐ Install flush system on urinal
- ☐ Fix exhaust fan or adequate ventilation in toilets.
- ☐ Use of bio-disinfectant and deodourant

Each practice carries 1 point. Maximum points = 10. One point for each tick mark. No points for partial implementation of the above practices.



Providing safe drinking water, improving sanitary conditions in schools, the community and at home, together with improvements in hygiene behaviour, can drastically reduce the incidence of diarrhoea and other infections among children.

The practice of washing hands with soap after defecation and the wearing of footwear are also vital for a healthy lifestyle.

The impact of the school sanitation and hygiene education programme is not limited to school children, but affects the wider community as well, because children influence the hygiene behaviour of their families, peers and neighbours.

TASK 5 How much rainwater does your school harvest?

Consult the school administration and the building plan for data on total area of the school including rooftop and paved area.

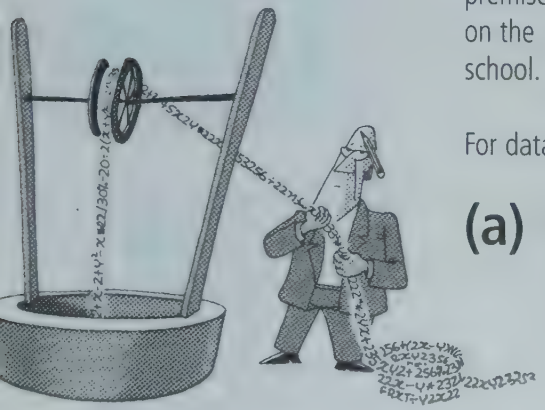
Rainfall (precipitation) is the primary source of fresh water on land. In this section you find out how much rainwater can your school catch? Or how much can it harvest? Rainwater harvesting, is a traditional, time-tested technology of collecting of rainwater, and using it to recharge groundwater, or storing it for other uses. Rain falls on three kinds of surfaces:

Rooftop area: This is the roof of your school building. Most of the rainwater that falls on its surface runs off. Almost 85 per cent of it flows down the pipes. The remainder is lost in evaporation, absorption and other losses.
Paved area: These are the semi-hard surfaces of your school paved with stones, tiles, gravel. This includes your driveways, basketball court Almost 70 per cent of the rainwater from this area runs off.
Unpaved area: This is the soft open surface of your school – lawns and playgrounds. The ground absorbs a huge amount of water and, only 30 per cent of it runs off.
Please read pg 16 for more information.

To find out the rainwater harvesting potential of your school, you will need to explore the rooftop, and the paved and unpaved area within its premises.

TO COLLECT DATA: For data regarding the area size go to the administrative office and ask for the layout plan of the school premises. The plan will provide the exact measurements of the plot size, the constructed area, ground etc. You can derive information on the paved, and rooftop area. To measure unpaved area, just subtract the total paved and rooftop area from the total area of the school.

For data on average annual rainfall in your area, check the internet or call the local meteorological department



Traditional dug wells and Persian wheels have fallen into disuse because of steadily declining water table.

(a) Rainwater your school can harvest:

Rooftop potential = Rooftop area x mm of rainfall / 100 x 85 =

+

Paved potential = Paved area x mm of rainfall / 100 x 70 =

+

Unpaved potential = Unpaved area x mm of rainfall / 100 x 30 =

Total volume available for harvesting in each category is counted as 100%.

Total volume available for harvesting =

Rooftop area _____ + Paved area _____ + Unpaved area _____

(b) Rainwater that is actually being harvested:

Find out how much of the potential runoff is your school harvesting.

Rooftop rainwater actually harvested = Rooftop area x mm of rainfall / 100 x 85 =

+

Paved area actually harvested = Paved area x mm of rainfall / 100 x 70 =

+

Unpaved area actually harvested = Unpaved area x mm of rainfall / 100 x 30 =_____

India gets 100 hours of rain in a year. If we learn to catch and store this water it could resolve the water crisis.

RAINWATER HARVESTED: CALCULATE YOUR POINTS

Rooftop area
Rooftop rainwater actually harvested / Rooftop potential x 100 x 0.15 ..... a

Paved area
Paved area actually harvested / Paved potential x 100 x 0.075 ..... b

Unpaved area
Unpaved area actually harvested /Unpaved potential x 100 x 0.025 c

The criterion is percentage of total area type from which runoff water is fed into a harvesting structure.

Total points = a + b + c

The weightages are allocated in proportion to quality of harvestable rainwater and utility.

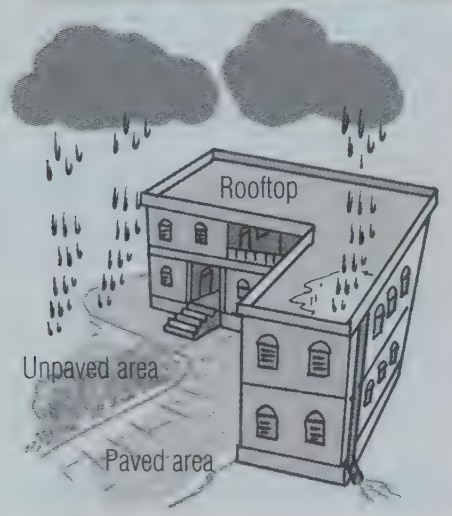
15 points for 100% runoff harvesting from rooftop.
7.5 points for 100% runoff harvesting from paved area.
2.5 points for 100% runoff harvesting from unpaved area.

Points scored for rainwater harvesting are = _____.

RAINWATER HARVESTING: SOME TIPS

WHAT IS RUNOFF?

Runoff is the term applied to the water that flows away from a catchment after falling on its surface in the form of rain. Runoff can be generated from rooftop, paved* and unpaved** catchment areas of buildings.



The nature of the catchment determines the quantity of runoff that is collected from the area. For example, about 85 per cent of the rain that falls over the tiled surface of a terrace would flow as runoff. In unpaved areas only 30 per cent of the rainfall on a wooded or grassy area would flow, the rest being retained on the surface and percolating into the ground. As paved areas are semi-hard, 70 per cent of the water is available as runoff.

From the point of view of quality, runoff can be divided into three types: runoff from rooftops, paved and from unpaved surfaces. Quality of runoff from rooftop is the cleanest and followed by paved surface. The runoff from unpaved surfaces may have bacterial or other contamination. If water is to be stored for drinking purposes, it is advisable that only runoff from rooftop surfaces is used.

*Note: *While finding out the rainwater harvesting potential, we multiply the equations with 0.85, 0.70 and 0.30 in order to take into consideration the absorption, evaporation and other losses.*

Source: Anon 2003, *A Water Harvesting Manual*, Centre for Science and Environment, New Delhi, p 6.

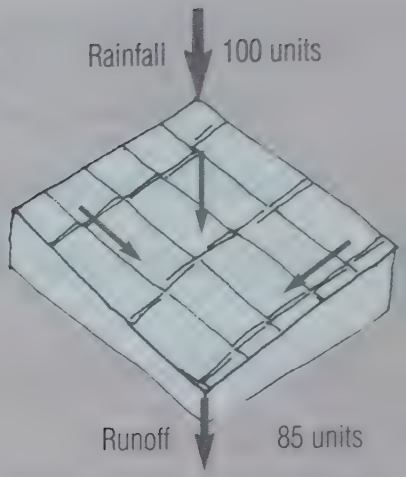


Figure 1.2 Runoff from a smooth tiled surface

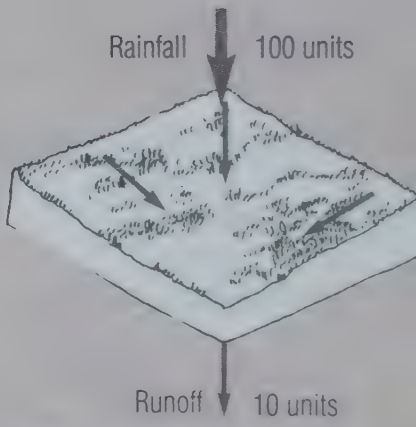


Figure 1.3 Runoff from a surface covered with grass

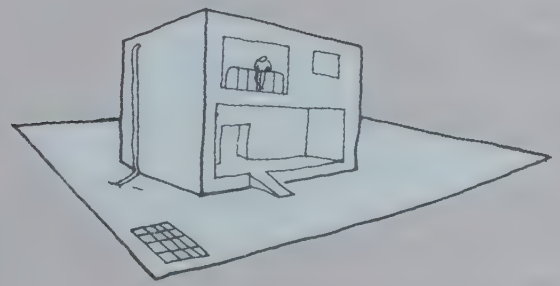
Rainwater can be harvested for two purposes:

1. Stored for ready use in containers above or below the ground.
2. Charged into the soil for withdrawal later.

WHAT IS A RECHARGE WELL?

A RECHARGE WELL IS USED TO REPLENISH THE GROUNDWATER TABLE.

- The depth of a recharge well should be within five metres of the water table.
- A recharge well should have a minimum diameter of 0.1 metres, a casing of slits, and be filled with grit.
- A recharge well should also have a proper recharge pit on the top.
- Ideally it should be big enough to hold surface runoff from an area of 500 square metres.
- A recharge well for an area of 500 square metres will have the capacity to hold 3 to 4 cubic metres of water.
- There should be a recharge bore inside the recharge well to carry the collected rainwater to underground aquifers.



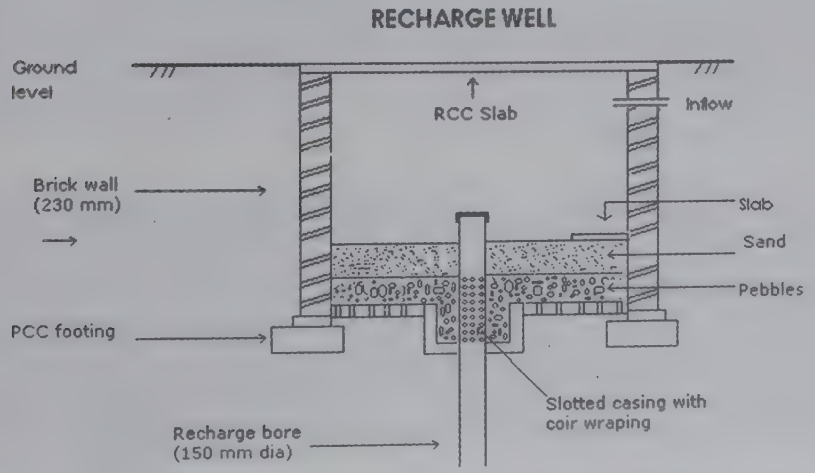
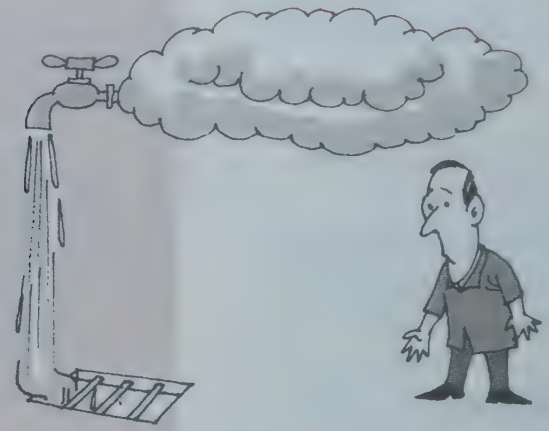


Figure 1.4 Location of recharge pit in a building area and detailed section of pit



Rainwater harvesting for groundwater recharge:

Divert runoff with help of pipes or drains to the inflow of recharge well.

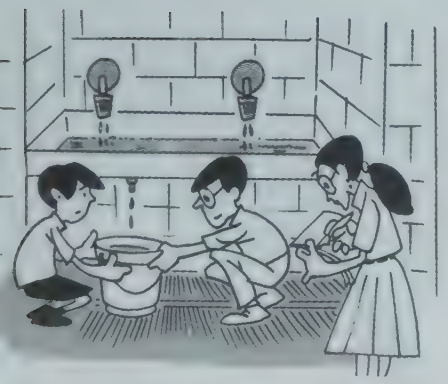
For more information log on to www.rainwaterharvesting.org

'White water' is water that is safe to drink. Most of the waste white water can be recycled.

'Grey water' is used water that is not contaminated with excreta or urine. This water can be used for watering plants.

'Black water' is water that contains excreta or urine. It is best to dispose black water in sewer lines.

'Compost toilets' or dry latrines help us reduce the quantity of black water.



TASK 6 How much water does your school recycle/reuse?

Water recycling is the process of treating waste water, in order to upgrade its quality, so that it can be used again. When water, once used for a particular purpose, is put to use again, it is then being reused. For example, if you wash vegetables with water and then pour the used water into a flower pot, it would be considered reuse.

Generally 80 per cent of the total amount of water used is available as waste water, which may be recycled or reused. Hence, waste water available for recycle or reuse in your school is:

(a) Total waste water generated:

Total consumption of water per day X 80 / 100 = _____

(b) Total water reused / recycled per day = _____

Now to find the amount of water reused/recycled use the following methodology

TO COLLECT DATA: If the school is reusing water, the audit team will have to measure the amount reused physically. For instance, if reuse is taking place at a drinking water point then put a bucket under the tap where waste water will be collected. Count the number of times the bucket gets filled. If the volume of the bucket is measured already, you will be able to calculate the exact amount reused.

If the school has a recycling plant, find out its capacity from the site engineer.

Now give points to your school using the formula given below:

RECYCLED WATER: CALCULATE YOUR POINTS

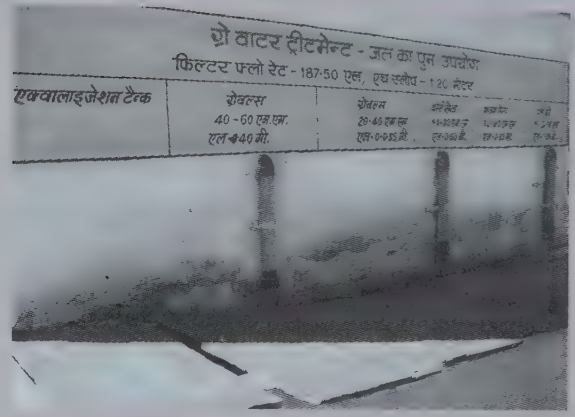
$$\frac{\text{Total Water reused/recycled (b)}}{\text{Total waste water generated (a)}} \times 100 \times 0.25^{*}$$

*Weightage: Points awarded for every per cent reused or recycled is 0.25. Total points = 25

Points scored for reuse / recycling of water are = _____.

Recycling sewage water: New innovations

People across the world are experimenting with ways to recycle.



Grey water treatment case studies

Grey water is used water that is not contaminated with excreta or urine. Several residential schools in Dhar and Jhabua districts have installed grey water treatment plants with help from government and non-government agencies to combat shortage of water.

Grey water treatment plants are constructed providing simple treatment techniques such as screening, equalisation, settling, filtration and aeration. Treated grey water can be used in cleaning toilets, watering lawns and floor washing.

Example: Grey water treatment plant in Girls Ashram School in Kokwad, District Jhabua, Madhya Pradesh.

The per capita consumption in this school is 40-50 litres per day. Out of this 5 litres per student per day is used for drinking, and threfore cannot be reclaimed.

The rest of the water is treated using a grey water system, comprising of an eqalisation cum settling tank with separate filtration units.

(Source: Dr. S R Wate, Wise water management – Water reuse for schools and households in rural areas of India – A guidance manual)

2006 Green Schools Award winner Boormajra's way

Schools across India are increasingly reusing water from drinking water fountains. Government Senior Secondary School, Boormajra in Ropar district of Punjab has constructed troughs beneath its drinking water taps. The spillage from the taps is collected in the troughs, which are connected to the plant beds nearby (or collected in buckets for later use). The school has been able to reuse almost 55 per cent of water used in this manner.

TASK 7 School's initiatives

Unless the management of a school takes a proactive stand on water conservation, a movement by teachers and students to use water sustainably will soon lose ground. Seek an appointment with the Chairperson, Manager and Principal of your school and ask them the questions on issues given in the table 5.

- If the answer is "Yes" give points on the basis of quality and quantity of work done. A maximum of 2.5 points can be awarded for each question.
- In case the answer is "No" give 0 points.
- Add the points to know how much your school scored.

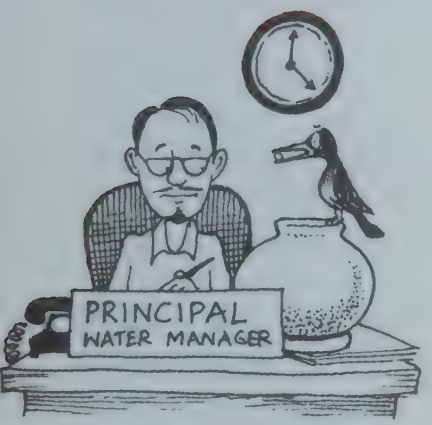


TABLE 5. School's initiatives

	Nature of school's initiatives	Weightages	Management's response	Points scored
1	Conduct regular awareness programmes on issues related to water? (Mention details of awareness programmes conducted)	2.5 points		
2	Involve the students in understanding water related issues inside the school? (Mention special activities conducted)	2.5 points		
3	Does the school have a policy on water? (Attach the policy document)	2.5 points		
4	Does the school have a separate environment teacher?	2.5 points		
5	Total	10 points		

Points scored for school's initiatives are = _____.

TASK 8 Final score

Now that you have worked out all the tasks, you are ready to finalise your school's report card for its water management practices. Fill in the table given below to determine the total points your school has scored for water related practices. You can get the points from the respective tasks:

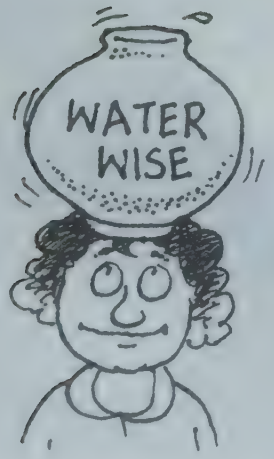


TABLE 6. Where does your school stand?

Category	Maximum points	Points scored
Water consumption (Task 2)	15	
Sanitation facilities (Task 3)	15	
Water conservation practices (Task 4)	10	
Rainwater harvesting (Task 5)	25	
Reuse / Recycling Task (Task 6)	25	
School initiatives (Task 7)	10	
Total	100	

GREEN SCHOOLS PROGRAMME

air

Give us our right to clean air

Check your school's Oxygen balance

What is the level of air pollution in your area?

Are families exposed to high RSPM levels in your area?

How eco-friendly are the vehicles in your school?

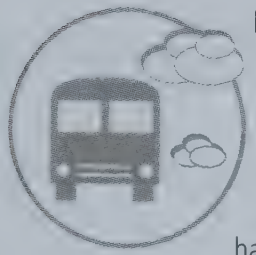
How do you travel to school everyday?

Are the rooms in your school well-ventilated?

CENTRE FOR SCIENCE AND ENVIRONMENT

Clearing the Air

Each year, approximately 0.8 million deaths are attributed to urban air pollution, says the World Health Organisation. And nearly two-thirds of the world's excess premature deaths due to air pollution are reported in developing Asian countries. *It has also been conclusively proved that vehicles are the most rapidly growing source of urban air pollution.*



But a city is stuck with its vehicles. Because vehicles mean transportation. And believe it or not, transport is the *most* important ingredient of development. Both in cities and in the villages. It may be a highway or a footpath or a rail track – carrying fancy cars or handcarts or trains – our lives and livelihoods depend on it.

Cities...attack of the autos

Let's look at our towns and cities. What is the most striking feature here? Population of course! They now have over 300 million people living in them—a number that is expected to shoot up to more than 400 million in the next five years. There is only one thing that is growing faster than this...the number of private cars and two-wheelers plying in these cities. A study done by the World Bank in 2001 has found that '*motor vehicle ownership and use*' in developing countries like India is growing faster than population. Between 1951 and 2000, while the total urban population in India increased just 4.6 times, the number of vehicles bounded up 158 times!

The pollution-vehicle link

Sources of air pollution are many and diverse. But none are as lethal as vehicles, as they are responsible for very high exposure. Vehicular emissions take place in the breathing zone of people. "So those who live or work in close proximity to heavily-travelled roadways are subject to high levels of exposure", say experts. And now there are plenty of studies to show constant exposure to auto exhausts causes severe health damages. Motor vehicles emit some of the deadliest carcinogenic (cancer causing) compounds. They also induce chronic and acute respiratory disorders.

Deathly car traps

In the global scenario, some of the worst cases of outdoor air pollution are now found in Indian cities, including the medium-sized and smaller towns. Urban air here is a cocktail of particulates and gaseous products, including nitrogen oxides (NOx), sulphur dioxides (SO_2), carbon monoxide (CO), benzene, ozone (O_3), a range of polycyclic aromatic hydrocarbons (PAH) and a variety of volatile organic compounds. But the overiding fear is concerning the chillingly high levels of particulate matter (PM),

especially of size less than 10 micron (PM_{10}), detected in the air. These finer particles, which are generated by combustion of fuels, travel deep into the lungs. Owing to their innate chemical properties and size, they can kill even at lower concentrations.

No wonder during the past few years, people here have been desperately looking out for tools to assess the problem and to find ways to combat the menace.

India: missed opportunities

Yet, cutting pollution from vehicles is proving to be the toughest part of the pollution control challenge. Why?
Is it because we produce extremely polluting cars which should be henceforth banned?
Is it because government-owned refineries are flooding cities with dirty fuels?
Or is it because no one is really planning to meet the traffic needs of cities?

Interestingly, India began regulating vehicular emissions in 1991, much before other Asian countries had even begun the process. But then it fell behind, slowly losing speed even as the number of vehicles in the Indian roads skyrocketed, and pollution levels scaled unprecedented heights. Held back by a reluctant automobile industry, that fought hard to keep the standards lax, it adopted the Euro I standards as late as 2000 – eight years after Europe! Prodded repeatedly by the Supreme Court to introduce stronger regulations, the government finally came up with the Auto Fuel Policy in 2003. As of now, only 11 cities have implemented Euro III, while the rest of the country have only moved to Euro II. The goal is to nudge the 11 to adopt Euro IV by 2010, as the others reach the Euro III mark. The process is further slowed down by the government owned refineries. There is a stubborn resistance from them to produce cleaner fuels needed to run the cleaner, less polluting vehicles.

The diesel menace

But is India really making a whole-hearted attempt to shift to cleaner vehicle technologies? Why then is it favouring diesel over petrol? Diesel engines do have some attractive features that make them very popular among consumers. They are more fuel-efficient than petrol engines, deriving more energy per unit of fuel used. So till recently, they used to dominate the heavy-duty, high usage vehicles sector. But now, it is rapidly taking over the personal car segment. Analysts in India predict that diesel car sales will grow by almost 40-50 per cent by 2010.

This will have a catastrophic impact on the air pollution levels in India cities. Why? Because diesel vehicles spew pollution at a far higher scale than petrol-run ones. The particulate emissions from diesel engines are 6-10 times greater. Diesel particles are particularly lethal as they are ultrafine and can be extremely effective carriers of toxic compounds.

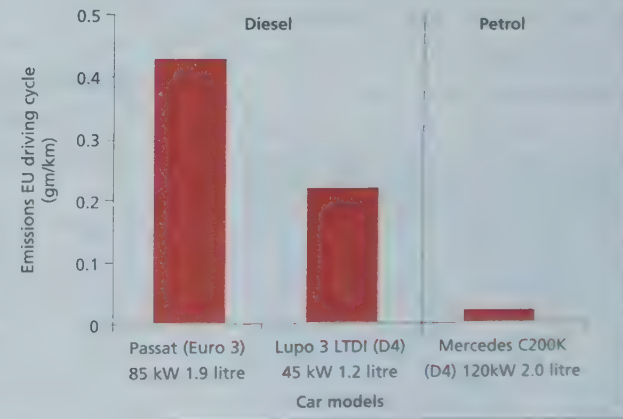
Most frighteningly, the Indian government, till date, has no policy either to hold car companies or refineries accountable for the public health fallout. So car makers can keep producing diesel automobiles while refineries churn out dirty fuels.

Indoor air pollution

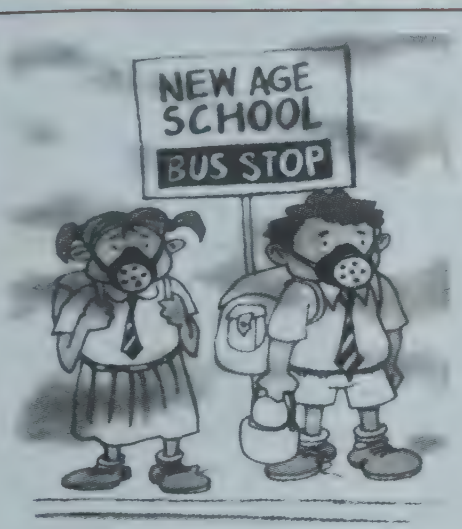
The poor – living in inadequately ventilated hutments – both in the rural and the urban centres, face serious health risks due to pollution from smoke inside their homes. Women squat for hours in front of their *chulhas* (stoves) cooking the family meals. Half of all the energy consumed in India is for cooking purposes and a huge percentage of this is from sources like firewood, dung, and agricultural waste. Children have a higher breathing rate which makes them more susceptible to respiratory ailments.

NOX-IOUS TRAIL

Actual NO_X emissions from diesel vehicles are several times higher than petrol cars



Note: Emissions measurement in EU driving cycle, D4 is identical to Euro IV in Germany
Source: Axel Friedrich 2004, 'Diesel toxicity and risk reduction strategy in Germany why Germany even after meeting Euro IV standards has a campaign on diesel?', paper presented at the conference 'The leapfrog factor: towards clean air in Asian cities' CSE, New Delhi, March 30-April 1, *mimeo*



Leapfrog to the future: India can beat pollution if technology improves as fast as possible. It can no longer afford to follow the track of the industrialised countries, which pumped in huge amount of toxins in the air and then introduced strict emission control measures to abate the crisis. India must leapfrog to the cleanest technology by switching fuels. Delhi did it by creating one of the largest public transport systems running on Compressed Natural Gas, replacing highly polluting diesel vehicles.

So what is the option? Going public, of course...

Public transport...the *Indian* way

Indian cities are traditionally known to be great users of public transportation. In fact, pedestrian ways and bicycles were the most common features of a typical Indian town. This is in sharp contrast to the car fetish of the West. But all that has changed–thanks to our current obsession with autos. In all Indian cities, motorisation is currently attaining dizzying heights. Though a very small percentage of the population actually use cars, the available road space – a very precious commodity in any urban centre – is getting locked up to cater only to them. Pedestrians and cyclists have practically lost their share of the road.

Buses...going bust?

First let's get the facts straight. A public transport bus occupies two times the road space of a car but can carry 20-40 times the number of passengers. So it pollutes less per passenger carried. But today, public transport system is one of the most neglected sectors in our country. Only 12 cities out of the 35 with million plus population in India have formed city bus undertakings to provide dedicated bus services to the people. The impact of this short-sightedness is alarming. In recent years, every city has recorded a steady decline in the fleet of buses that are available for public use. Result? While travel demand in cities has grown phenomenally, number of passengers availing city bus services is on the decline.

Crossing over—a deadly trend

Now this is really dangerous. Why? Because people saying 'no' to public transport services can only mean that they are being forced to opt for private vehicles. Therefore, more cars or two wheelers on the roads – more congestion – more pollution.

So what do we do?

It is obvious that all our cities are in a pretty critical shape. The transport demand is too high – passenger load too gigantic. *(See box: Leapfrog to the future)*

A 'combo'of old and new: The focus now is on Mass Rapid Transport Systems (MRTS). These are specifically designed to carry a large number of passengers rapidly at one time. For instance the metro. But MRTSs need huge investments and a great deal of time to start operating. If it fails to deliver the goods, that is, transport large volumes of passengers–comfortably and at an affordable price–the people will simply not use it. **So experts say that cities should integrate the rail and the bus transit systems. And make sure that they blend in smoothly.**

Mission GSP: Green Schools Programme makes the school community examine the air it breathes, minutely and scientifically. It also helps it to assess the impact its commuting practices and other systems have on the atmosphere. The main objective is to assist schools to evolve and adopt the least polluting way of life.

AIR

The air audit involves finding out your schools contribution/responsibility in polluting the air. The audit will help in devising strategies for clean air:

- The scoring system will enable your school to find out the kind of air quality standards your school environment is providing.
- The process will help to establish your school as a model for providing an eco-friendly transport system.
- The teachers will get an opportunity to educate students about sustainable practices.
- The students will get to learn about choices they can make to clean up their air.

TASK 1 **Choose your air audit team**
TASK 2 **Check your school's Oxygen balance**
TASK 3 **What is the level of air pollution in your area?**
TASK 4 **How much Respirable Suspended Particulate Matter (RSPM) do you and your neighbours inhale?**
TASK 5 **How eco-friendly are the vehicles in your school?**
TASK 6 **How do you travel to school everyday?**
TASK 7 **Are the rooms in your school well-ventilated?**
TASK 8 **Your school's initiatives**
TASK 9 **Final score**

TASK 1 Choose your air audit team

- Just like water team, you would require at least 5 to 10 of your schoolmates in the air audit team. The teacher coordinator may be a science or social science teacher with interest in air pollution issues. Do include the school transport incharge and the drivers of school transport in your audit team.

School : _____

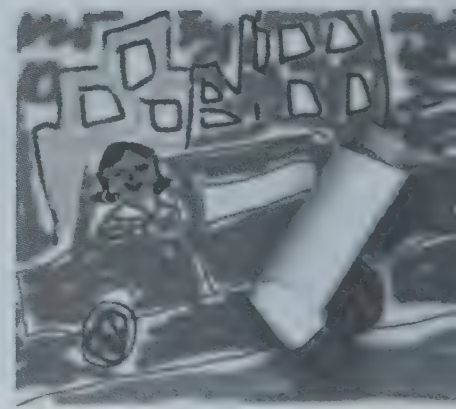
Teacher: _____

Administrative staff: _____

Students: _____

_____ Date: _____

Working together is fun and it is an opportunity to get to know people.



There are set parameters for testing air. If the pollutants present in the air cross a certain limit, it is considered harmful. To check the quality of air around you, take a look at the table given below.

In this chapter, separate sets of activities have been put together for rural and urban schools. So identify the category your school belongs to by referring to the criteria mentioned below. On the basis of the choice made select the set of Tasks your school will have to follow to complete the audit.

The Indian Census, besides giving the basic count of population of towns and cities in the country, produces and presents data on various demographic, social, and economic characteristics for rural and urban areas. The conceptual unit for urban areas is a 'town', whereas for rural areas it is a 'village'. The classification of an area as an urban unit in the census of India 2001 is based on the following definition:

- All places declared by the state government under a statute as a municipality, corporation, cantonment board or notified town area committee, etc.
- All other places which simultaneously satisfy or are expected to satisfy the following criteria:
  – A minimum population of 5,000;
- At least 75 per cent of the male working population engaged in non-agricultural economic pursuits: and
  – A density of population of at least 400 per square kilometer (1,000 per square mile).

As in the past censuses, well-defined outgrowths (OGs) of statutary towns have also been included in the extended urban area. Any area which is not covered by the definition of urban is rural. At the time of 2001 census there were 6.38 lakh villages and 5,161 towns including 502 statutory towns and 636 census towns in India.

TABLE 1: National Ambient Air Quality Standards (NAAQS) for selected pollutants in India (in micrograms per cubic metre)

Pollutant and time-weighted average	Concentration in ambient air			Impacts on our body
	Industrial area	Residential, rural and other areas	Sensitive area	
Sulphur dioxide (24 hours)	120	80	30	Irritates lower lung
Oxides of Nitrogen (24 hours)	120	80	30	Causes bronchitis, asthma
Suspended particulate matter (24 hours)	500	200	100	Irritates the respiratory tract and causes coughing
Respirable particulate matter (size less than 10 µgm) (24 hours)	150	100	75	Causes several respiratory system disorders
Carbon monoxide (8 hours)	5	2	1	Causes oxygen deficiency in the body

Source: CII 1999, *Environmental Legislation in India — A Guide for Industry and Business*, New Delhi.

Where is your school located?

- Air is a very dynamic medium. It does not limit itself to political boundaries.
- Air pollution has the capacity to affect people and places that are not actually causing pollution.

SCHOOL LOCATION: Tick mark the type of area your school is located in.

Area description	
Industrial area	☐
Within 100 metres of a very busy traffic intersection or high-density traffic movement.	☐
Residential, rural, sensitive and other areas. (Schools are supposed to be located in sensitive areas).	☐

HOT TIPS

Switching to smokeless *chullah* (if biomass is burnt for cooking), restricting burning of leaves, grass, paper, plastic waste inside and around the school, use of proper fuel for generators and ensuring adequate exhaust facility for its emissions.

TASK 2 Is the school community's use of Oxygen balanced?

Air is the most critical factor for human survival. A human being uses about half-a-litre of Oxygen (O_2) per minute. So in a space of 4m^3 there is enough oxygen for about 4 hours. The critical limiting factor is the Carbon Dioxide (CO_2) that we breathe out at a concentration of about 3.5% (35,000 ppm). This corresponds to just under half-a-litre per minute (0.4 litre per minute) of pure CO_2. Humans are affected by too much CO_2 in the air, more quickly than by lack of oxygen. There is a simple way to get rid of CO_2 which lasts forever. Plants take in CO_2 and emit Oxygen in a process called photosynthesis, 12m^2 of plants would produce enough Oxygen to keep a human being alive, and at the same time they would naturally scrub the air clean of CO_2.

TO COLLECT DATA: To find out the total oxygen requirement of the school refer to the total strength of the school calculated in the water chapter. The total green area will include the area of any space that is covered by grass, shrubs and trees. Do not include the clay pots in this count.

How much Oxygen does your school community consume?

To find out use the formula given below :

Total strength x .5 x 60 x number of working hours _____

TO COLLECT DATA:

- To calculate O_2 producing capacity of a green surface, apply the formula used to find area of a circle or a square, a rectangle or a triangle, as per its shape.
- To calculate O_2 producing capacity of a tree, use approximate line of sight for choosing measurement points. In case of a roughly circular tree measure the longest diameter, shortest diameter, add both and divide by 2.
- Divide the average diameter by 2 to derive the radius. Then apply the formula to find out the area of a circle (πr^2)

How much green area is needed to generate the required quantity of Oxygen?

Total strength x 12 metre square _____

How much green area does your school have? (Find out from how to collect data box given on the side.)

It is assumed that the leaf surface area producing oxygen will be equal to area of the canopy.

CALCULATE YOUR POINTS: OXYGEN BALANCE

$$\frac{\text{Total green area of the school}}{\text{Green area required}} \times 100 \times .10$$

If your school has more green area than required, it gets full 10 points

Points scored for oxygen balance are = _____.

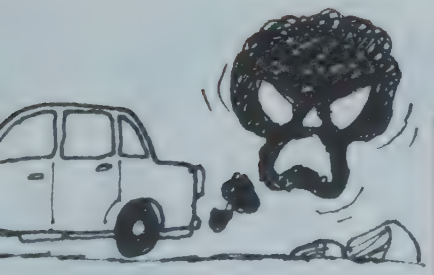
TASK 3 What is the level of air pollution in your area?

(This task is for urban areas only)

Contact Central Pollution Control Board, State Pollution Control Board or University to find out the highest and the lowest NOx, SOx, CO, RSPM and Ground Level Ozone readings over a period of 8 hours. This assignment will fetch you 10 points.

POLLUTION LEVELS: WRITE THE VALUE IN THE BOXES GIVEN BELOW

NOx (oxides of nitrogen)	SOx (oxides of sulphur)	CO (carbon monoxide)	RSPM (respirable suspended particulate matter)	Ozone (ground level)



Vehicular transport is the single largest source of air pollution in the world.

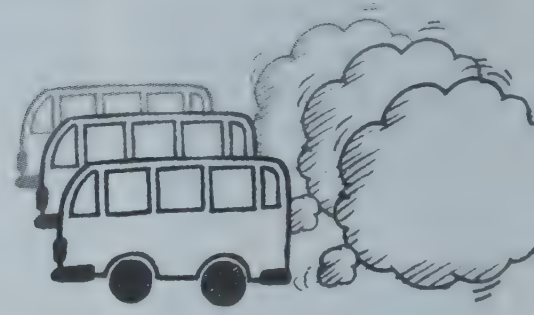
TASK 4 Are families exposed to high RSPM levels in your village?

(This task is for rural areas only)

Several studies have found that women suffer from heart diseases such as coronary pulmonale (enlargement of heart) and chronic bronchitis when exposed to wood smoke. The magnitude of the problem of domestic pollution was known by early 1980's and was documented in The State of India's Environment – Citizens' second report. The data indicated that several tasks can be taken to cut down exposures to smoke while cooking, the reducing its adverse impact on health. These include efforts to increase the use of alternative biomass fuels such as biogas and charcoal; to produce stoves that are designed to reduce exposure to smoke; and to ensure better ventilation in rural homes. Did you know that:

- In India, women exposed to domestic smoke during pregnancy, have one-and-a-half times the odds of stillbirth, compared to mothers who are unexposed.
- Poliution levels in homes with wood-burning *chullahs* are 50 per cent higher than those using kerosene.
- About 23 per cent of Indian women using biomass fuels (wood, crop residues and animal dung) reported having respiratory disease symptoms, compared to 13 per cent of kerosene users and 18 per cent of liquified petroleum gas (LPG) users.
- At least one-third child death is due to accute respiratory infections, with an overwhelming majority being in developing countries. If children were exposed to less smoke, up to 25 per cent of respiratory infections could be eliminated.
- Biofuels account for nearly half of India's total energy supply, including more than 80 per cent of household energy consumption.

Well-maintained vehicles, carrying the right number of passengers cause less pollution and hence contribute to improvement of air quality.



Impact of biomass burning on health

- Blindness
- Respiratory diseases
- Chronic respiratory diseases
- Chronic obstructive lung diseases
- Tuberculosis
- Cancer

CALCULATE YOUR POINTS: RESPIRABLE SUSPENDED PARTICULATE MATTER

$$\frac{\text{Number of families having smokeless chullahs}}{\text{Total number of families represented in school}} \times 100 \times .10$$

Points scored for RSPM in your area are = _____.

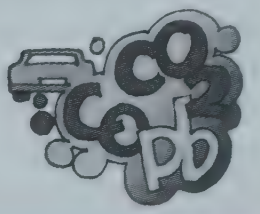
Interview the school drivers and verify the fuel used and the actual mileage of the vehicles

TASK 5 How eco-friendly are the vehicles in your school?

In this section, you will check the health of vehicles used by your school. Two critical parameters are applied to assess polluting levels of a vehicle:

1. Mileage: The number of kilometres a vehicle runs on one litre or kg of fuel. A vehicle offering poor mileage is definitely a polluting vehicle.

2. Passenger capacity: An overloaded vehicle puts extra pressure on the engine, which leads to greater emission. On the other hand, if a vehicle carries much less than its actual capacity, the per capita emission of the passengers escalates. In both cases, fuel is being wasted.



First task is to list the number and types of vehicles used by the school.

TABLE 3: Total number of vehicles used by school

Vehicles	Numbers	Petrol	Diesel	CNG	Others	Remarks
Buses						
Buses on contract						
Cars						
Cars on contract						
Two-wheelers						
Others (on contract)						
Total						

Note: Do not enter any personal vehicle

COLLECTING DATA: Ask the students to go to the school office and get a list of vehicles owned by the school. Take the survey sheet given as Table no 4 on pg. 23.

The drivers can be asked to come to the classroom with all the papers of their vehicles. Let the students verify the fuel used and the actual mileage.

The mileage given by the manufacturer can be verified from the instruction book of the vehicle or can be checked from the sales agency or internet.

After collecting the data as given alongside, put it in the table given below. You can photocopy or recreate the table below, if your school has more number of vehicles.

TABLE 4: Vehicle data

Sl. No.	Vehicle description	Mileage			Passenger capacity		
		Manufacturer	Existing	Points	Manufacturer	Existing	Points

HOW ECO-FRIENDLY ARE YOUR VEHICLES: CALCULATE YOUR POINTS

1. The school scores 15 points if the vehicles provide good mileage. The standard used is the one stated by the manufacturing company.

$$\frac{\text{Mileage of the vehicle}}{\text{Mileage stated by the manufacturing company}} \times 100 \times 0.125$$

2. The points scored for mileage of all vehicles is the sum of points scored by each vehicle divided by the total number of vehicles in the school, excluding cycles.

3. 15 points are earned, if the school transport carries passengers as per the capacity specified by the manufacturing company of the vehicle.

   If passengers carried are less than the capacity specified by the manufacturing company:

$$\frac{\text{No of passengers carried}}{\text{Passenger capacity stated by the manufacturer}} \times 100 \times 0.125$$

   If the passengers carried are above the capacity specified by the manufacturing company:

$$\frac{\text{Passenger capacity specified by the manufacturer}}{\text{No of passengers carried}} \times 100 \times 0.125$$

Weightage: The **maximum points** you can get in this section is **25**. Note: Carry these points to Table 8.

Schools can play a vital role in motivating and mobilising people to take action to prevent air pollution

Points scored for health of vehicles are = _____.

TASK 6 How do you travel to school everyday?

TO COLLECT DATA:

Students: Individual class monitors can be put in charge of recording the commuting practices of his/her classmates, and then forwarding the data to the audit team.

Teachers: Some members of the audit team can consult the teachers and collect information.

Other staff: The same as for the teachers.

Contact individual class monitors to survey their classes for means of commuting, and forward the data to you

With growing cities, one has to travel far to go to school. You will be using the school bus or van or public transport to get to school. If your house is nearby, you will be either walking or cycling. Some of you will be also taking your personal vehicle, be it a car or a two-wheeler (see box: Collecting data on left). To know how the students, teachers and other staff in your school travel daily, the teacher/coordinator in the team should ask the students to fill up the transport survey sheet in Table 5. After completing the survey, use the compiled information to fill up Table 5.1 on the next page. To calculate the points scored by your school for travel practices subtract minus (—) points from the plus (+) points as directed in Table 5.2 given on the next page.

TABLE 5: Transport survey sheet

S. No	Name	Status (Student, teacher, other staff)	Distance (kms)	Mode of transport

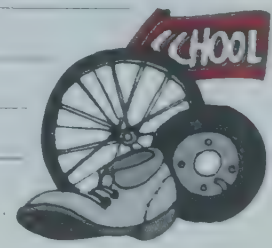


TABLE 5.1: Use the information collected in Table 5 to fill up this table

Mode of transport	Students	Teachers	Administrative and support staff	Total
School bus				
Public bus				
School transport				
Public transport				
Personal four-wheeler				
Personal two-wheeler				
Taxi four-wheeler				
Taxi three-wheeler				
Bicycle				
On foot				
Others				
Total				

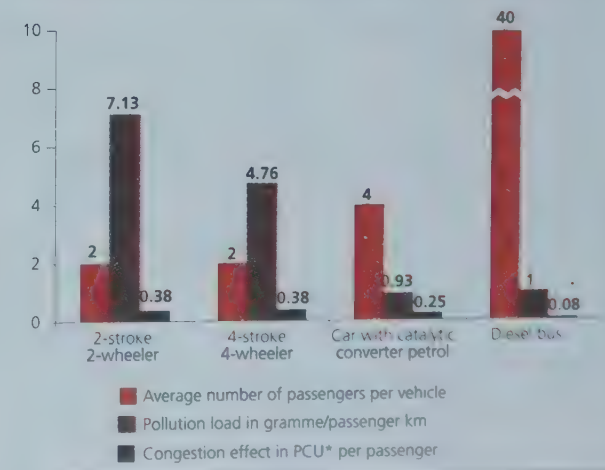
Considering the number of passengers a vehicle carries, if a person travels in a two-wheeler, he contributes eight times more pollution than a person travelling in a bus. It is six times if it is a three-wheeler and one time more if a person travels by a car.

Compile all the above data into three main categories given below in table 5.2

TABLE 5.2: Points scored for different travel choices (see box on the page alongside)

Mode of transport	Number of people	Percentage	Points scored
PUBLIC/MASS TRANSPORT (School bus, Public bus, School transport, Public transport, Metro, Car pool etc.)			
PERSONAL VEHICLES (Personal four-wheeler, Personal two-wheeler)			
NON-POLLUTING TRANSPORT (Bicycle, On foot, Skating, etc.)			
Total			

COMPARISON OF VEHICLE TYPES



Source: Anon 2003, Draft Urban Transport Policy, Ministry of Urban Development Delhi

COMMUTING PRACTICES: CALCULATE YOUR POINTS

Make the right choices. Learn to differentiate between means of transport you choose.

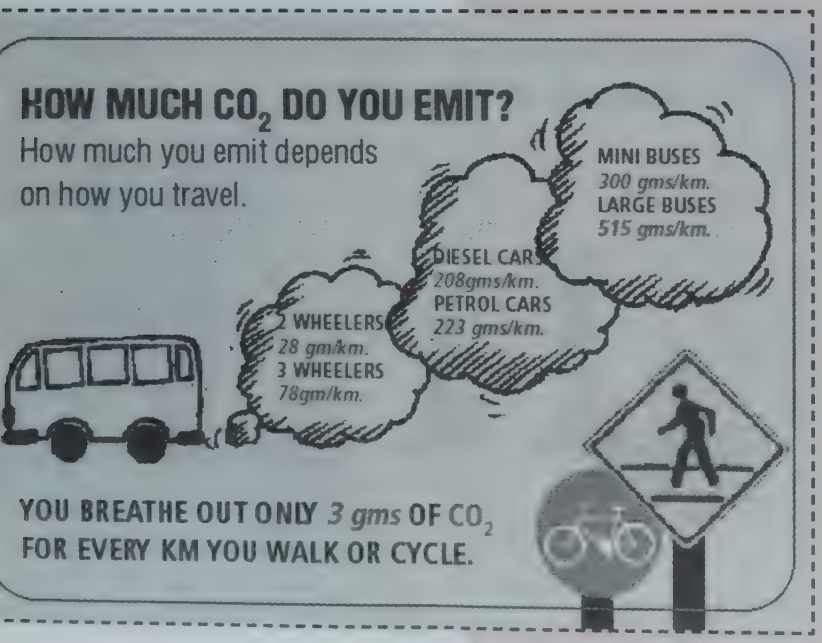
Plus points

The following means of transport will be considered as means of mass transport and shall carry positive points:

- School bus
- Travelling by public bus
- School transport
- Public transport
- Other means

1. Points scored for travelling by mass transport

$$\frac{\text{Number of persons travelling by mass transport}}{\text{Total strength of the school}} \times 100 \times 0.20$$



2. Points scored for travelling by bicycle or walking.

$$\frac{\text{Number of persons using bicycle}}{\text{Total strength}} \times 100 \times 0.30$$

Use the formula given above to calculate points for people travelling on foot.

Minus points

The following means of transport will be considered as personal vehicles and shall carry negative points:

- Personal two-wheeler
- Taxi four-wheeler (not shared)
- Taxi three-wheeler (not shared)

Points scored for travelling by personal vehicles:

$$\frac{\text{Number of persons using personal vehicles}}{\text{Total strength of the school}} \times 100 \times 0.30$$

2. Add the points scored under the 'plus points' section and under the ' minus points' section separately.

3. Subtract the total 'minus points' from the 'plus points' to know the points scored by your school.

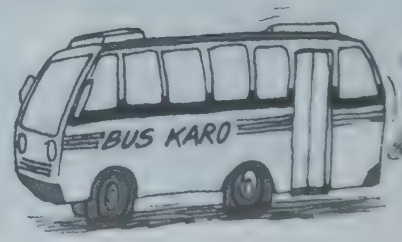
Weightage: The **maximum points** you can get in this section is **30.**

Points scored for commuting practices are = _____.

TASK 7 Are the rooms in your school well-ventilated?

- Circulation of fresh air keeps the mind and body healthy.
- Proper ventilation allows circulation of fresh air.
- Inadequately ventilated rooms are stuffy, suffocating and unhealthy.
- Lack of fresh air results in foul smell and rise in humidity and temperature due to body heat.
- In schools where the children come to learn, adequately ventilated rooms become all the more important.
- One person needs 15 CFM (Cubic feet per minute) of air to be comfortable. (1 foot/minute = 0.3048 metres/minute)

Travelling by public transport reduces the per capita consumption of fuel and hence it reduces pollution. It also improves the traffic movement in the area.



To find out how many rooms are well-ventilated in your school, calculate as given below:
Amount of air inside the room = length x breadth x height of the room
Amount of air required every minute = Number of people in the room x 15 (per capita requirement per minute)
Window size required = Number of people in the room x 15 (per capita requirement per minute)
Amount of time the air needs to be replaced in = Amount of air inside the room / Amount of air required every minute (Required capacity of the exhaust fan, air cooler or air conditioner)

For example a room of size 12 feet (length) x 12 feet (breadth) x 10 feet (height) with 15 people in it, two opposite placed windows of size 6 feet (length) x 6 feet (breadth) are necessary to replace 1,440 (12 x 12 x 10 = 1,440) cubic feet of air every 6.4 minutes [one person needs 15 cubic feet of air per minute CFM — 1,440 / 225 (15 x15)] in the room. In case the room cannot have a window of adequate size or it is used by a larger number of people it is important to have an exhaust fan to circulate the air. In case the room has no vents then it has to be air conditioned.
(1 foot = 0.3048 metres)

TABLE 6. Indoor air quality

Total number of rooms in your school	
Total number of well-ventilated rooms in your school	

INDOOR AIR QUALITY: CALCULATE YOUR POINTS

$$\frac{\text{No of well-ventilated rooms in your school}}{\text{Total number of rooms in your school}} \times 100 \times 0.15$$

Weightage: Indoor air quality carries a maximum of 15 points. Note: Carry these points to Table 8.

Right fuel choices, proper management and maintenance of vehicles can considerably reduce the negative impact on environment.

Points scored for indoor air quality are = _____.

TASK 8 School's initiatives

It is very important to appreciate the initiatives taken by the management of an institution on issues related to air and transport. The approach of the management to issues related to air and transport can be assessed in the following ways:

Seek an appointment with the Chairperson, Manager and Principal of your school and ask them the questions on issues given in the table 7.

- If the answer is "Yes" give points on the basis of quality and quantity of work done. A maximum of 2.5 points can be awarded for each question.
- In case the answer is "No" give 0 points.
- Add the points to know how much your school scored.

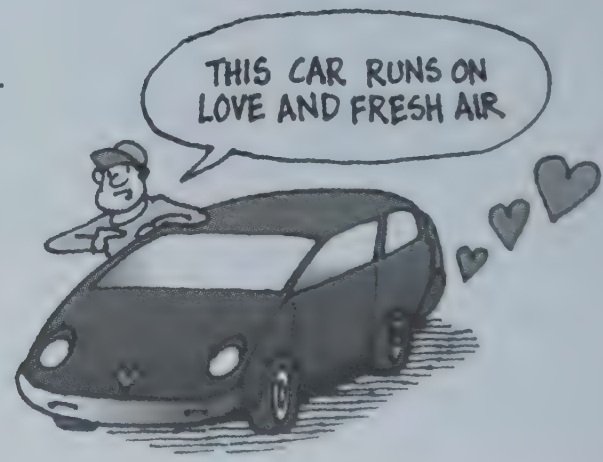
Fill in Table 7 to explain the initiatives taken by the school management and calculate the points for this section.

TABLE 7. School's initiatives

Nature of school's initiatives	Weightages	School's response	Points scored
1 Conduct regular awareness programmes on issues related to air and transport? (Mention details of awareness programmes conducted)	2.5 points		
2 Involve the students in understanding issues related to air and transport inside the school? (Mention special activities conducted)	2.5 points		
3 Does the school have a policy on air and transport? (Attach the policy document)	2.5 points		
4 Implementation of any transport management scheme for improving air quality	2.5 points		
5 Total (Carry these points to Table 8)	10 points		

New technologies like electric, hybrid and hydrogen vehicles make the car more environment-friendly in terms of regular emissions, but it does not reduce the ecological footprint of the car.

Points scored for school's initiatives are = _____.



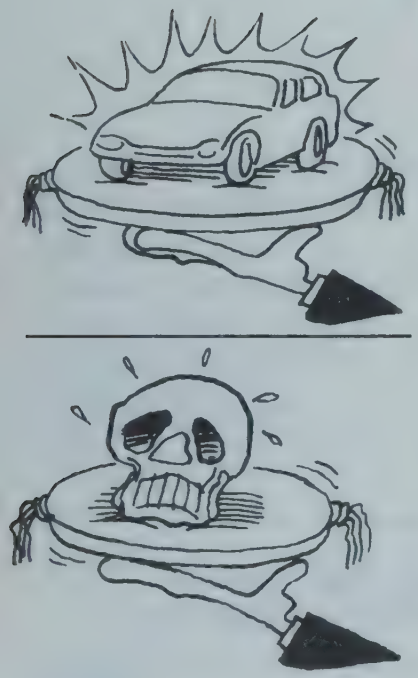
TASK 9 Final score

Now that you have worked out all the tasks you are ready to finalise your school's report card for its air and transport management practices.

Fill in Table 8 to determine the total points your school has scored for practices related to air and transport. You can get the points to be filled from the respective tasks:

TABLE 8. Where does your school stand?

Category	Maximum points	Points scored
Oxygen Balance (Task 2)	10	
Air pollution levels (Task 3)	Urban 10 / Rural 0	
RSPM (Task 4)	Urban 0 / 10 Rural	
School vehicles (Task 5)	25	
Commuting practices (Task 6)	30	
Ventilation in rooms (Task 7)	15	
School initiatives (Task 8)	10	
Total	100	



The mobility, comfort and convenience of the automobile is an illusion. The long-term cost to our environment and health makes the purpose self-defeating.

It is very important for a school to check its air quality standards in the interest of children's health. So activities to prevent air pollution, especially in the area of transport, should be carried out throughout the year in the school. This will help the school management to devise a clear transport policy for improving the air quality.

Total points scored in the air section are = _____.

land

Create a landscape for learning

What is the percentage of green area in your school?

What is the per capita constructed and field area of the school?

How many species of plants and animals does the school support?

What types of pesticides does the school use?

CENTRE FOR SCIENCE AND ENVIRONMENT

Greens in peril

The future of every country in this world, including India, or at least its ability to feed its people, depends on the health of its soil. Land also, is the habitat of a gigantic number of plant and animal resources, which again are a human being's insurance for survival. So this resource is of enormous ecological, economic, and social value.

The Indian terrain

What is the status of our country's land resources? Agricultural scientists say that India has enough to feed even twice its existing population. But only if the soils are managed well. At present, complete mismanagement prevails, and a mammoth portion of India's total land area – more than 25 million hectares – is seriously degraded. The prime factors contributing to this are large scale soil erosion; water stagnation, which in turn makes soil turn saline; and over-use of chemical fertilisers and pesticides.

Living resources

Plant and animal life, as it has evolved on this earth, has produced a bewildering diversity. There are millions of species of plants and animals, but even within a species, there exists enormous diversity. For instance, there are an estimated 120,000 types of rice plants alone in the world. This massive diversity, or gene pool, as scientists like to call it, is a common heritage of all human beings. It is also their insurance for survival. As new varieties of plants and animals useful to human beings are bred, this massive gene bank provided by nature becomes vitally important.

Eroding fortunes

In certain areas of our country hundreds of hectares of fertile top soil, containing precious nutrients like nitrogen, phosphorous and potassium get washed away annually. While there are several reasons behind this huge scale of erosion, degrading forest lands is certainly one of the leading ones.

In India, ambitious afforestation schemes were introduced in the 1980s, as the country was losing almost a million hectares of forest cover every year. Social forestry programmes enlisting help of local rural communities were spearheaded.

At the same time a massive tree planting initiative, with a target of planting eight billion trees across India, was also unleashed. All these efforts *have* paid dividends, and the total area under green cover *has* grown during the past decades.

But though long-term afforestation measures have been able to contain the pace of forest cover loss, land under dense forests is shrinking steadily. Today India is dotted with large, severely degraded tracts, which according to the official records are forest lands, but not a single tree can be found standing on them!

Irrigation: blessing or bane

Croplands need water to sustain productivity, and irrigation canals bring farmers this vitally important input. But they also have the potential to turn green fields into waterlogged and saline wastelands. Lands in canal areas are mostly flat and poorly drained. As a result, irrigation water remains standing for a very long time. This harms, rather than benefits the health of the soil, turning it saline and infertile.

Chemical crisis

Indian soils are generally poor in plant nutrients like nitrogen, phosphorous and potassium. So the government encourages farmers to use large quantities of chemical fertilisers to ensure high yield. But in the long run indiscriminate use of these chemicals have proved to be dangerous for the fertility of the soil.

The other types of chemicals that are used in farm lands are in the form of pesticides. India is a voracious consumer of pesticides. The total demand for insecticides here is over 1,00,000 metric tonnes (MT) for agricultural and 50,000 MT for public health.

And their deadening impact...

Nearly all these chemicals have the potential to significantly alter ecosystems; many are toxic to humans; and others are concentrated in the food chain. Once applied to cropland, a number of things may happen to a pesticide. It may be taken up by plants or ingested by animals, insects, worms, or microorganisms in the soil.

Extensive studies the world over have shown how the pesticides affect the soil health by killing the vital microbial fauna present in it. Each gram of soil may contain millions of microbes, which are important to sustain plant life. Pesticides not only kill these microbes, they persist in the environment and have been observed to accumulate in the food chain. It is due to their tendency to accumulate in the animal fatty tissue, and move up the food chain, that their residues have been found even in mother's milk.

Health hazard

Now if the soil is contaminated by this poison how can our bodies remain immune to it? Pesticides which enter the human system are potent enough to ravage our metabolism. They are now known to cause lethal diseases ranging from several forms of cancer, liver damage, and reproductive dysfunction to neurological disorders like Parkinson's and Alzheimers.

Rich soils, live treasure

The Indian subcontinent, with its vast range of ecological zones, sustains a tremendous amount of diverse life forms. About 15,000 species of plants and 75,000 animal species have been identified in India. On two per cent of the world's land mass, we possess around five per cent of the living organisms on earth.

This rich diversity contributes enormously to the economy. Unfortunately, a massive portion of this wealth is being threatened by human activity on land and forests. Plant species face extinction, many of which may be lost even before their

What do trees do?

Trees offer a fertile nurturing ground for all land-based ecological processes. A healthy green cover can, in fact, regenerate even the most highly degraded eco-system.

Green belts create the following conditions in cities and villages located in and around them:

- Recharge the groundwater table.
- Prevent soil erosion at times of floods and heavy rain.
- Act as a wind barrier at times of cyclones.
- Reduce seawater incursion.
- Act as a medium of energy absorption and reduce the impact/eliminate at times of disasters like Tsunami.
- Act as carbon sinks (see Energy chapter), and combat pollution in atmosphere.

Mining menace

Mining forms the bedrock of industrial development, and boosts the economy. It also lays barren the land, denudes forests and pollutes water.

Currently, the total land (including forests) leased out for mining (for coal, metallic and non-metallic minerals) in the country stands at 7,54,861 hectares.

When a tract of land is chosen for mining, vast portions of lands (mostly forests) are cleared for building roads and infrastructure development. These lands are environmentally and often socially significant. The deforestation leads to soil erosion, loss of habitat, and affects the entire balance of the ecosystem.

There are two processes of mining – open cast and underground. Open cast mining is the removal of the topsoil, earth, rock and other materials (called overburden) – to gain access to the ore seam, which is drilled or blasted for mineral extraction. This destroys vegetation, soil and habitat completely. And in underground mining, tunnels are dug directly to reach the mineral ore. This makes the land void. And when the rock overburden can no longer be supported, deep cracks open up. Eventually the surface collapses, which cause extensive damage to agricultural land, buildings and transport networks.

Lucky Indian farmer

possible value is known to society. And wildlife is threatened by large-scale poaching, fuelled by a flourishing trade in wildlife products.

Habitat destruction and disappearing wetlands have also taken a heavy toll of bird life in India.

Mission GSP

The Green School Programme acts as a tool to explore, identify and document the living resources which exist within the school premises. The audit process helps the school community to draw up a roadmap for sustainable use of its land.

LAND

- Your school's grounds can provide excellent educational opportunities for creating awareness about land resources and the natural world around you.
- A proper management of land resources can transform the grounds into biologically diverse outdoor classrooms and healthy open spaces.
- The green area in your school has an important role because on one hand it minimises the effects of air pollution and on the other it gives you an opportunity to explore the local species of plants and animals.
- The simple tasks given below, along with the scoring system will help you to understand how green your school is.

TASK 1 **Choose your land and biodiversity audit team**
TASK 2 **What is the percentage of green area in your school?**
TASK 3 **How much land area is covered by trees?**
TASK 4 **What is the per capita constructed and field area?**
TASK 5 **How many species of plants and animals does your school support?**
TASK 6 **Which pesticides does your school use?**
TASK 7 **School's initiatives**
TASK 8 **Final score**

Working together is fun and it is an opportunity to get to know people.

TASK 1 Choose your land audit team

- The school gardener is certainly the best person to be a part of your audit team. Make sure the biology or geography teacher of your school joins your team. Just like all other teams, 5 to 10 of your committed and interested schoolmates would make a strong team. Try and involve some students of the photography or painting club of your school.

School : _____

Teacher: _____

Administrative staff: _____

Students: _____

_____ Date: _____

TASK 2 What is the percentage of green area in your school?

Did you Know?
Loss of green cover has led to an increased occurrence of natural disasters. Dangerous dust storms in Asia have intensified five-fold in 50 years. They originate in China, where 30 per cent of the land is parched by overfarming, overgrazing and deforestation.

Why should you have green areas? What is the role of plants in soil conservation?

- Plants provide protective cover on land and prevent soil erosion
- They help in retaining rainwater on land.

To understand the land-use pattern you must first find out the total land area available to your school.

TO COLLECT DATA: Students will need to measure all green spaces, using the formula for deriving area of different shapes, and add them up to calculate the total green area. You can also take help from the water team, which will collect data on unpaved areas in the school compound. These, usually, are the green areas.
Fill the details in the table given below:

TABLE 1: Total land area occupied

Description	Area in square metres
Constructed area	
Green area* inside the boundary	
Unconstructed barren area or others	
Total land area	

*Green area includes any area which has grass cover, tree cover and horticulture.

The total land area is _____ square metres.

Find out the percentage of green area. Follow the method given in the box below.

GREEN AREA: CALCULATE YOUR POINTS

$$\frac{\text{Total green area in square metres}}{\text{33\% of total area in square metres}} \times 100 \times 0.10$$

This section carries 10 points.

The points scored for green area are = _____.

TASK 3 How much of the land is covered by trees?

You already know how much green area your school has. Now find out how much of the total green area is covered by trees. Ideally 11 per cent of the total area of the school should be under tree cover. To find out how to carry out this process refer to the Air chapter, Task 2, Page 24

TREE COVER: CALCULATE YOUR POINTS

$$\frac{\text{Tree canopy area}}{\text{Total land area / 9}} \times 100 \times 0.10$$

This section carries 10 points

The points scored for tree canopy area are = _____.

TASK 4 What is the per capita constructed and field area?

Congestion leads to pressure on resources and hence on our environment.

TO COLLECT DATA: The total constructed area can be sourced from the building construction plan of the school which will be available in the school office. Or else, measure the constructed spaces and use the formula for calculating areas of various shapes to derive the data and add them all.

TABLE 2: Recommendations for basic requirements of school buildings

Description	Primary school m^2	Secondary school m^2	Composite school m^2
Built up area per student	1.80	3.40	2.60
Playfields	1000	15000	19000
Plot area other playfields	2 - 3 times the built up area (on all floors) depending on the number of storeys		

Modified from Indian Standards Institute - IS - 8827 - 1978. The following minimum may be taken when planning spaces in a school. Find out the total built up (see rainwater harvesting task in water chapter)

Per capita urban land consumption is not limited to the size of a person's house plot or to a person's proportion of the land covered by an apartment complex. It also includes a portion of all the other land that has been converted from rural to urban use to provide for jobs, recreation and entertainment, shopping, parking, transportation, storage, government services, religious and cultural opportunities, waste handling, and education.

So the level of per capita land consumption is based both on direct individual decisions and behavior, and on collective decisions made through the government and the marketplace.

The biological diversity supported by an area is a good indicator of its ecological well-being.

Find out how healthy is your school campus?

Look around, it is teeming with life

Biological diversity is not limited to wilderness areas. If you keep your eyes and ears open, you will definitely be dazzled by the variety of life-forms that you will observe. Many plants and animals are uniquely adapted to Indian urban ecosystems. Squirrels, mongoose, palm civets, bats, reptiles, amphibians and butterflies are some animals that have adapted to the urban ecosystem very successfully.

Find out the total number of students in your school (see water consumption task in water chapter)

Built up Area per student = Total built up area/ Total number of students =

Playfield per student = Total area of the playfield/Total number of students =

LAND USE: CALCULATE YOUR POINTS

If your school exceeds the ISI standards, then you get full points.

Built area of the school

$$\frac{\text{Area per student available in school}}{\text{Area per student as per ISI standard}} \times 100 \times 0.05$$ ..... a

Playfield of the school

$$\frac{\text{Total area of playfields in your school}}{\text{Applicable ISI standard area}} \times 100 \times 0.05$$ ..... b

Total points scored in this task is a + b = _____

Weightage: Land use carries 10 points.

The points for land-use pattern are = _____.

TASK 5 How many species of plants does the land support?

This task will help you to understand the number and variety of plants that the land supports. Identify the various species of plants in your school and fill in Table 3. Photocopy the table to list all species of plants.

TO COLLECT DATA: Make two teams of students. One for plant species and the other for animal species. Get the school gardener and the biology teacher to accompany them. Start listing down plant species and animal species that are visible to the naked eye. If you can find the botanical names well and good. If not, even the local names would do.

Count the plants you have listed in Table 3 and write the total in the space given below.

TABLE 3: The diversity of plant life

Sl. No	Local name	Latin name	Put a tick on the correct box				Remarks
			Trees	Shrubs	Grass	Flowering plants	

+Get 2.5 as bonus points
Which is the oldest tree in your school?

Approximate age: _____

Species: _____

The total number of plants the land supports is = _____.

How many species of animals does the land support?

This task will help you to understand the number and variety of animals that the land supports. Identify the various species of animals in your school and fill in Table 3.1. Photocopy the table to list all species of animals.

Count the animals you have listed in this table and write the total in the space given below.

TABLE 3.1: Number of animals

Sl.No	Local name	Latin name	Vertebrates/Invertebrates	Remarks

+Get 2.5 as bonus points

Does your school house endangered species?

Numbers:_____

Species:_____

The total number of animals the land supports is = _____.

DIVERSITY OF SPECIES: CALCULATE YOUR POINTS

- The baseline against which biodiversity will be gauged is 100 species of flora and 50 species of fauna.
- Please note that the baseline figures do not include micro-organisms.

1. Points scored for diversity of floral species:

$$\frac{\text{Total number of floral species}}{100} \times 100 \times 0.175 = a$$

* 2.5 points to be awarded for identifying the specie and the approximate age of the oldest tree in the school.

2. Points scored for diversity of faunal species:

$$\frac{\text{Total number of faunal species}}{50} \times 100 \times 0.175 = b$$

*2.5 points to be awarded for identification of endangered specie in the school.

4. Total points = a + b _____ .

Weightage: The maximum points for this section are 40.

Interesting things to do: The photography club of your school can click photographs of various plant and animal species to prepare a scrap book. Alternatively, some painting club children can draw. Making a biodiversity register of the school would be a good idea.

Make friends with the gardener to find out more about the plant species in the school.

Points scored in the biodiversity section are = _____.

TASK 6 Does your school use pesticides? Which ones?

TO COLLECT DATA

As most of the pesticides are used by the gardener or house-keeping staff, enlist their help. Ask and identify the pesticides.

Usually pesticides are popularly known by their brandnames, like Baygon. Read the bottles or packing to identify the chemical formulation of the pesticide.

Pesticides are used to kill pests. But lately it has been found that they can be lethal for human beings also. Liberal use of pesticides in houses, farms, and industries during the past few decades has led to contamination of the water we drink, the air we breathe and the land we cultivate. Some of the pesticides have been banned.

TABLE 4: Banned Pesticide use

Banned pesticides	Tick the ones used by your school	Remarks
Aldrin		
Benzene Hexachloride		
Calcium Cyanide		
Chlordane		
Copper Acetoarsenite		
CIbromochloropropane		
Endrin		
Ethyl Mercury Chloride		
Ethyl Parathion		
Heptachlor		
Menazone		
Nitrofen		
Paraquat Dimethyl Sulphate		
Pentachloro Nitrobenzene		
Pentachlorophenol		
Sodium Methane Arsonate		
Tetradifon		
Toxafen		
Aldicarb		
Chlorobenzilate Use banned w.e.f. 17.7.2003		
Dieldrine --do--		
Maleic Hydrazide --do--		
Ethylene Dibromide --do--		
TCA (Trichloro acetic acid) --do--		

TABLE 4.1: Pesticide / Pesticide formulations banned for use but allowed for export

Pesticides	Tick the ones used by your school	Remarks
Nicotin Sulphate		
Phenyl Mercury Acetate		
Captafol 80% Powder (Banned- 17.7.2003)		

TABLE 4.2: Pesticide formulations banned for import, manufacture and use

Pesticides	Tick the ones used by your school	Remarks
Methomyl 24% L		
Methomyl 12.5% L		
Phosphamidon 85% SL		
Carbofuron 50% SP		

TABLE 4.3: List of pesticides restricted for use in India

Pesticides	Tick the ones used by your school	Remarks
Aluminium Phosphide		
DDT		
Lindane		
Methyl Bromide		
Methyl Parathion		
Sodium Cyanide		
Methoxy Ethyl Merciru Chloride (MEMC)		

Sometimes people use banned pesticides because they are cheap. But they have serious side-effects.

The tasks given below set the targets for formulating the school's pesticide policy.

First: The school must completely stop the use of banned or restricted pesticides.
Second: The quantity of pesticides being used must be reduced and replaced by bio-pesticides like Neem and Turmeric powder.

Fill in Table 4.4. This will help you find out the quantity of pesticide being used in your school.

Pesticides kill useful insects also! Use them wisely.

Pesticides are chemicals synthesised to kill pests. After decades of their use it has been discovered that pests gradually develop immunity to them. Also, these chemicals get diffused in the environment and get magnified in the food chain, killing useful animals and plants.

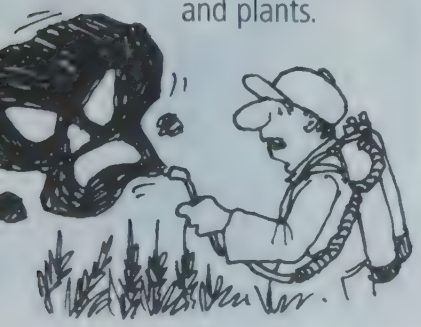


TABLE 4.4: Pesticides used in your school

Pesticides	Quantity used	Tick if banned or restricted	Remarks
Total			

PESTICIDE USE: CALCULATE YOUR POINTS

1. If no pesticides are used — 20 points.
2. If only bio-pesticides are used — 20 points.
3. If banned or restricted pesticides are used — 0 points
4. If your school uses a combination of pesticides:

$$\frac{20 \times \text{Percentage of bio-pesticide}}{100} = \text{Points scored}$$

Weightage: 20 points will be awarded for restricting use of pesticides.

The points for discouraging pesticide use are = _____.

TASK 7 School's initiatives

Seek an appointment with the Chairperson, Manager or Principal and understand the initiatives taken by the management on issues related to land and biodiversity. Ask questions based on points given below.

- If the answer is "yes" give points on the basis of quality and quantity of work done. A maximum of 2.5 points can be awarded for each question.
- In case the answer is "no" give 0 points.

TABLE 5: School's initiatives

Nature of school's initiatives	Weightages	Management response	Points scored
1 Conduct regular awareness programmes on issues related to land and biodiversity? (Mention details of awareness programmes conducted)	2.5 points		
2 Involve the students in understanding issues related to land and biodiversity inside the school? (Mention special activities conducted)	2.5 points		
3 Does the school have a policy on land and biodiversity? (Attach the policy document)	2.5 points		
4 Implementation of any land or biodiversity management scheme	2.5 points		
5 Total **(Use these points in Table 6 for the audit of Land and biodiversity).**	10 points		

This will help you find out if the school management is encouraging the initiatives taken by the school community to preserve land and biodiversity resources.

The points of the school for its initiatives are = _____.

TASK 8 Final score

To determine the points scored by your school for land management and biodiversity fill up the table given below:

TABLE 6: Where does your school stand?

Category	Maximum points	Points scored	Credit points
Percentage of green area (Task 2)	10		
Tree canopy area (Task 3)	10		
Land use (Task 4)	10		
Biodiversity (Task 5)	40		
Pesticide use (Task 6)	20		
School's Initiatives (Task 7)	10		
Total	100		

The natural world is governed by one law – that is – take only as much as you need for your physical survival. It is a wonder how so many living things can coexist governed by the above law.

energy

Energy saved is energy produced

How much energy does your school consume?

How clean are the sources of energy in your school?

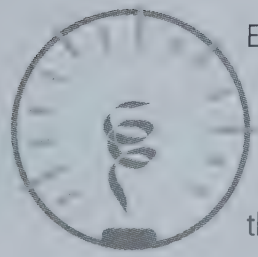
What are the energy conservation practices adopted by your school?

How much energy does your school save?

CENTRE FOR SCIENCE AND ENVIRONMENT

Becoming energy efficient

The problem in using gigantic volumes of fossil fuels – coal, petroleum and natural gas – is that besides being physically limited, they also pose a serious threat to our health and environment.



Electric bulbs, cars, fans, air conditioners, televisions, cooking ovens, *chullahs*, machines. Energy conjures up images of almost everything that makes up our everyday life. In fact, it is even more fundamentally linked to us than that. All living organisms—plants, animals, and human beings – rely on external sources of energy – radiation from the Sun in the case of green plants; chemical energy in some form in the case of animals – to be able to grow and reproduce. And to work. To put it in a nutshell, energy is the basic block on which life in this planet is built.

Now, here are some interesting nuggets of information about this resource. It is subject to the law of conservation of energy. According to this law, energy cannot be produced or destroyed. It can only be transformed. But here again there is a catch.

There are some forms of energy which are renewable. Energy harnessed from sun, wind, water, fall in this category. Energy produced from stuff we usually discard as garbage, like dead trees, branches, left-over crops, and gobar or dung along with other forms of livestock manure – resources collectively called "biomass" – can also be used, and then replenished.

Then there is a second category. The non-renewables. All forms of fossil fuels—oil, coal and natural gas—are examples of this. We are now using fuels that were made more than 300 million years ago, before the time of the dinosaurs. They are being depleted slowly but steadily due to constant use. India, for instance, has oil reserves at present production levels only for 19 years, gas for 28 years, and coal for about 230 years. Then once they are gone, they are gone.

Unfortunately for us, and the rest of the global community, we are heavily dependant on the non-renewables, the fossil fuels. It began two hundred years ago, when the world experienced an energy revolution that launched the Industrial Age. The

catalyst was ordinary black coal, an energy-rich hydrocarbon. It ousted wood, that had been used as the primary fuel for thousands of years. The energy stored in coal gave inventors and industrialists the power they needed to process steel, propel steamships, and energise machines. Soon petroleum and natural gas were exploited as high quality energy products, and they, too, joined coal as principal fuels. Fifty years later, scientists tapped uranium to fuel nuclear reactors and provide atomic energy, which again is a finite resource!.

Since then, we have come to rely more and more on the non-renewables to sustain our alarmingly swelling energy needs. Now, there is one more problem in using gigantic volumes of coal, petroleum and natural gas. Besides being physically limited, they pose a serious threat to our health (see box: Health impact and fossil fuels) and environment.

Burning fossil fuels play havoc with the health of this planet.

This is how it happens. In the atmosphere, carbon usually pairs up with two oxygen atoms and takes the form of carbon dioxide (CO_2). The heat trapping properties of CO_2 helps keep the Earth from freezing, by creating the greenhouse effect. But as volumes of energy used by human beings grow steadily, monstrously high quantities of carbon dioxide are pumped into the air. The main culprits are the fossil fuels—the fumes of which contain CO_2 gas. The current global average atmospheric concentration of CO_2 is 380 parts per million—36 per cent more than the 280 ppm present in the pre-Industrial Revolution era. Now the world's top climatologists predict that unless something drastic is done to cut down fossil fuel emissions, the global average temperatures would rise to 3 to 6 degrees Celsius by 2100. And as the Earth's surface temperature increases, glaciers melt as a result of the rising heat, and cause oceans to slowly creep up and swallow low-lying islands.

Scorching point

The impact of 'global warming' has already reached scorching levels, and is rising rapidly. Here is a sample of what the future holds:

- The most critical link between glaciers and climate is maintaining the earth's water balance. In fact, glacier melt has contributed as much as 30 per cent of sea level change in the 20th century.
- There will be dramatic changes in weather patterns. Rainfall will increase sharply in higher altitudes and decrease in lower levels. Storms and hurricanes will become more frequent. So will heat waves and droughts. Threats of natural hazards, ranging from cloudbursts, avalanches, landslides, to glacial lake outburst floods (GLOFs), mudflows and earthquakes will intensify.
- Alaska's melting glaciers, sea ice, and a type of frozen soil called permafrost are adding an extra 0.3 millimeter a year to the depth of oceans. Between the 1950s and 1990s, Alaskan glaciers contributed only half that much water. If drastic steps are not taken, the world can expect sea level to rise by 18-59 cm by 2100. This will spell doom for small island states and low-lying deltas like Bangladesh and Egypt.

Dangerous addiction

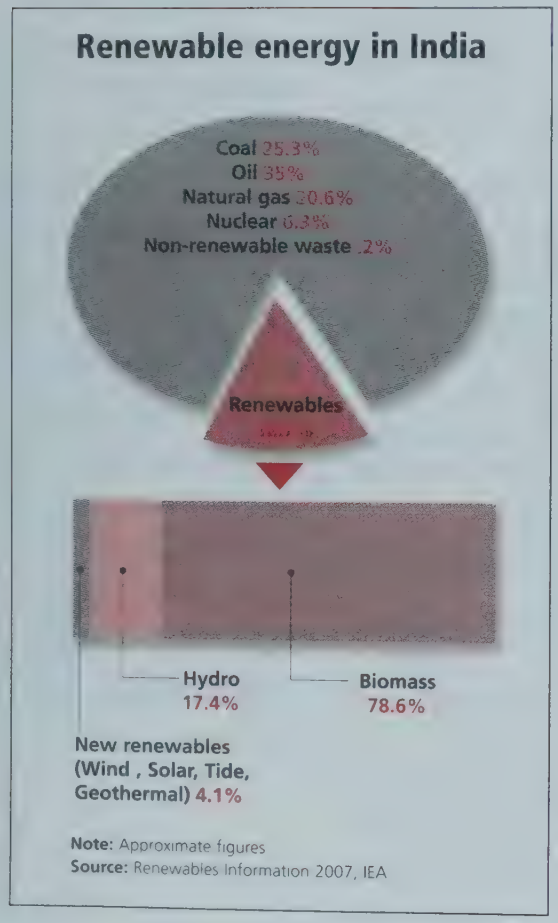
So there are two key issues that loom in front of us as we explore this wonder resource called energy. First, there are finite or limited amounts of non-renewable energy sources. But unfortunately, the human race has become addicted to these, and has

Health impact and fossil fuels

The burning of fossil fuels releases a complex mixture of pollutants. The ones on which regulators keep a watchful eye are: particulate matter (PM), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO) and ozone (O_3). These have lethal side-effects on human health. Exposure to these elements causes both acute short-term effects like eye irritation, headache and nausea, as well as chronic long-term diseases such as cardiovascular and respiratory disorders, and lung cancer.

already used up far more than it can afford to. So Planet Earth is heading for a major Energy Crisis.

Second, overuse of these forms of energy has completely tilted the atmospheric balance that Nature had created to make this a live-able planet. Emissions from vehicles fuelled by gasoline and factories that burn oil are now turning it into a boiling pot.



So what do we do?

How can we prevent this life-engendering resource from turning into a life-endangering one?

We consume less and conserve: Saving energy is the first step to energy conservation. So switching off electrical gadgets when they are not being used; or stopping the car engine while waiting at a traffic signal point, are a great way to start the process. However, this is not enough. Investing in products, appliances and services that use energy more efficiently is the second step. Like using Compact Flourescent lamps, that consume 40 per cent less electricity than ordinary bulbs; or driving fuel-efficient vehicles. New and innovative technology is the buzz word here.
But again, this is not enough!

We find alternatives: Technology has to be used to find more long-term and sustainable solutions than that. Like finding ways to harness energy from the renewable sources more efficiently, cost-effectively, and at a larger scale. Sun, wind, and biomass can be used to produce energy that can be spent and then created again. Without threatening the precarious climatic balance – as these sources are far less polluting than fossil fuels. Interestingly, in India, this switch-over will mainly affect those who live in cities and towns. Because they are the prime consumers of fossil fuels or commercial energy. Did you know that the urban population in our country – that accounts for less than 30 per cent of our total population, consumes more than 80 per cent of the commercial energy? The rest of the 70 per cent still depend on non-commercial sources, like wood, dung, and agricultural wastes to cook, to light their homes and to move around.

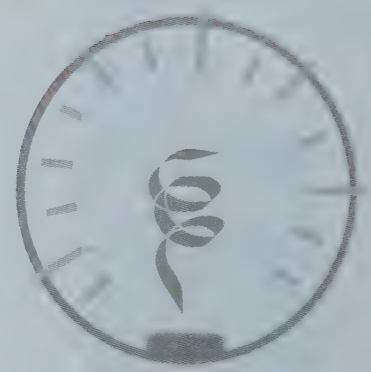
Mission GSP

This programme focusses on auditing consumption of non-renewable sources of energy in school premises. The audit establishes the current consumption levels and practices of schools in context of various sources of energy. The weightages given help participants to identify levels of consumption that are sustainable and most importantly, achievable on the ground. The manual can also be used by an institution as a tool to hammer out long-term energy conservation strategies and to assess its achievement in comparison with others, year after year.

ENERGY

Energy has transformed our material life and brought magic to our lives through its different forms — light, sound, heat and electricity. But we consume it in large amounts and often waste it.

- This section will help you use energy intelligently. It will tell you how to conserve the natural resources used up for energy.
- The scoring system will enable you to understand the energy consumption pattern of your school and find ways to save it.
- The process will help to establish your school as a model for providing energy management.
- The teachers will get an opportunity to educate students about sustainable practices.
- The students will get to learn how saving energy can reap a better future.



In 1878, Thomas Edison invented the light bulb after trying more than 1,600 different filaments, including hair from an assistant's head!

TASK 1 **Choose your energy audit team**
TASK 2 **What are the sources of energy in your school?**
TASK 3 **How much energy does your school consume?**
TASK 4 **Does your school follow energy conservation practices?**
TASK 5 **How much energy does your school save?**
TASK 6 **School's initiatives**
TASK 7 **Final score**

TASK 1 Choose your energy audit team

- School administrative staff must be members of your team as you would require electricity bills, fuel consumptions etc. Other support staff like generator attendant, electricians are also important contacts. It would be a good idea to rope in a Physics or science teacher with you as the calculations get complicated some times.

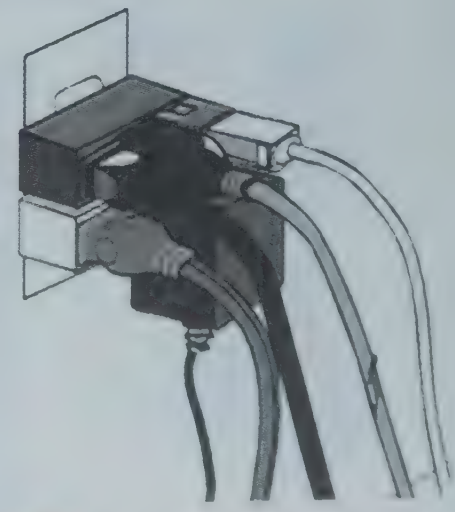
School : _____

Teacher: _____

Administrative staff: _____

Students: _____

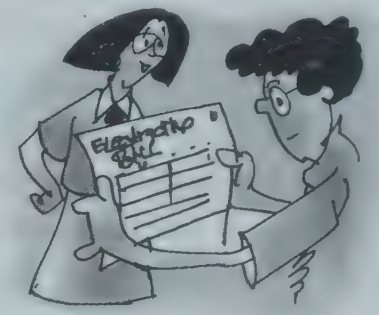
_____ Date: _____



How much energy does your school consume?

In this section you will find out the per capita consumption of energy in your school, just like the water section of the Green Schools Programme.

This will involve finding out the different sources of energy used and jotting down the monthly consumption. The energy audit is also a good opportunity to interact with people, who are not students or teachers, like the canteen boy, electrician and other administrative staff.



TO COLLECT DATA: *Electricity:* The audit team will have to get in touch with the administrative staff in the school office to procure the electricity bills. Take an average of the bills for the entire year.

Diesel: Ask the generator attendant to show the log book of fuels and find out how many litres are being used. If diesel is being used for transport, the transport incharge will have the register with details about the amount consumed.

LPG: Ask the mess staff, how many cylinders are used in one month on an average. Remember each cyclinder generally weighs 14.2 kg.

Make similar estimates for other fuels.
Remember the energy output of a generator would be taken only in terms of input, i.e, fuel used.

Once all the data is procured, put it in the chart given in table 1 on page no. 53. This is called the energy chart of the school.

But , one kilo watt hour of electricity and one litre of petrol cannot be added to find the total energy consumption. They are two separate units. Hence, you will have to convert all these figures into one common unit of energy i.e Joules. Table 3 on page no. 54 gives the calorific values of fuels generally used by us. Use the values to convert all consumptions into Mega Joules. All the values can then be added together to find out the total consumption of energy in the school.

TABLE 1: Total energy consumed by the school

Source of energy	Quantity consumed/monthly average	Energy consumed in MegaJoules (MJ)
Electricity from the board	kwh	
Petrol	Litres	
Diesel	Litres	
CNG	kilogrammes	
Kerosene	Litres	
Coal	kilogrammes	
Wood	kilogrammes	
Animal sources	kilogrammes	
Solar	kwh	
Wind	kwh	
LPG	kilogrammes	
Others (specify)		
Total		

Remember to meter all sources of energy. This is the first step towards saving energy.

Once you have found out the total consumption, you need to find out the per capita consumption:

Energy consumption per day = Total energy consumption/30 = _____

Per capita consumption of energy = Total energy consumption per day/ Total strength = _____

ENERGY CONSUMPTION: CALCULATE YOUR POINTS

1. If the per capita consumption per day is less than the ideal given in Table2, your school gets full points.
2. If your school per capita consumption is more than double the ideal energy consumption your school gets 0 points
3. If the per capita is more than the ideal then use the formula:

$$\frac{\text{Ideal per capita energy consumption}}{\text{Your per capita energy consumption}} \times 100 \times 0.30$$

Table2: Average consumption of energy

Uses	Day scholar	Day boarding school	Residential school school
Electricity	3.6	5.4	7.2
Transport	36	36	10.8
Others	3.6	5.4	3.6
Total	40.2-46.2	43.8-49.8	18.6-24.6

Note: Units calculated in MJ/day/person

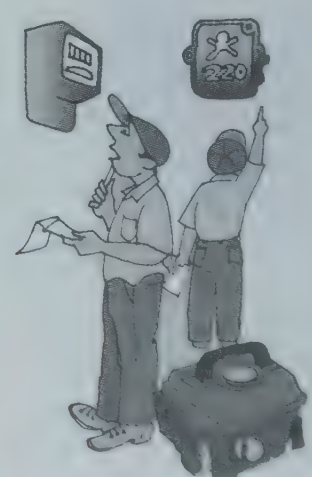


TABLE 3: Gross calorific value of some materials and outputs from people and office equipment

Gross calorific value of some typical materials		Some typical outputs from people and office equipment	
Product	**Value/MJ/kg/ltr**	**Nature**	**Value/Watts**
Biomass	8.6	Light office work	140
Electricity (1kwh)	3.6	Light factory work	235
Paper	14.6	Heavy factory work	440
Rags	16.3	Intelligent VDU	500
Wood	17.6	Small printer	450
Straw	18.0	80mb disk drive	980
Animal waste	18.0	Small photocopier	750
Rubber	34.7	Running photocopier	1500
Plastics	37.0	Electric typewriter	50
Coal	26.4	Coffee maker	400
Oil	44.0		
Petrol	46.7		
Diesel	45.6		
Kerosene	44.7		
CNG	52.4		
LPG	51.6		
Electricity (1kwh)	3.6		

Source: Richard Heede *et al*, *Home Made Money*, Brick House Publishing Company, New Hampshire.

Renewable sources of energy like solar, hydel, wind power should be promoted since they are light on our environment.

Points scored for consumption of energy are = _____.

TASK 2 How clean are the sources of energy in your school?

In this section, the audit team will have to find out how much energy does the school derive from each type of energy source. The points will be given on the basis of how clean it really is. Again, this will be determined by assessing how environmentally responsible is the extraction process of that type of energy. Also, renewable sources of energy are given more weightage than non-renewable ones. Thus, Compressed Natural Gas (CNG) has more weightage than diesel, because it generates less pollution than diesel.

TO COLLECT DATA: The data collected in the previous task will be used in this task. Hence copy the different energy consumptions in MJ from table 1 in table 4.

TABLE 4: Total energy consumed and cost incurred by the school

Source of energy	Energy consumed in MegaJoules (MJ)	Percentages	Points
Electricity from the board			
Petrol			
Diesel			
CNG			
Kerosene			
Coal			
Wood			
Animal sources			
Solar			
Wind			
LPG			
Others (specify)			
Total			

The percentages in the above table can be found out by the following formula:

$$\text{Percentage} = \frac{\text{Energy from a particular source}}{\text{Total energy consumption}} \times 100$$

SOURCING OF ENERGY: CALCULATE YOUR POINTS

Points would have to be found for each type of source of energy, by using the formula

$$\frac{\text{Percentage}}{100} \times \text{Weightage}$$

Note: The maximum points that can be scored for sourcing of energy is 15.

Theft of electricity is a major problem in India. Over 40 per cent of electricity produced is not paid for.

People in rural India are wise to use biomass as fuel. It is a renewable source of energy. If used to light a smokeless *chullah* it is not harmful to health.

TABLE 4: Energy source weightages

Sl No	Source of energy	Weightage	Sl No	Source of energy	Weightage
1.	Electricity from the board	7.5	2.	Electricity from the generator	5
3.	Petrol	5	4.	Diesel	2.5
5.	Kerosene	2.5	6.	CNG	10
7.	LPG	10	8.	Coal	2.5
9.	Wood	10	10.	Animal sources	15
11.	Solar	15	12.	Wind	15
13.	Hydel	10			

Points scored by the school for energy consumed are =_____.

TASK 4 Does your school follow energy conservation practices

TO COLLECT DATA:
Put a tick mark in the box if the practice is universally applied in the school campus. Do not put tick mark for partial implementation. Calculate your points for use of CFLs separately and add to the total points.

Each practice carries 1 point. The third practice carries 3 points (see box: Collecting data on right). If your school does not use any equipment listed below it gets one point for each appliance. Tick (✓) the practices your school follows:

- ☐ Do you turn off the lights when not required?
- ☐ Are the tubelights and bulbs in your school clean?
- ☐ How many CFL tubes does your school have?

  Number of CFLs / Total number of lighting points x 100 x .03

- ☐ Are the filters of air conditioners cleaned every month?
- ☐ Are the air conditioners in your school set to 27 degrees celsius, considered to be the most suitable temperature for human body?
- ☐ Are refrigerators kept away from direct sunlight and sources of heat?
- ☐ Are the refrigerators in your school properly sealed?
- ☐ Are computer monitors in your school turned off when not in use?

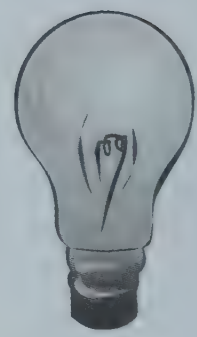
TASK 5 How much energy did your school save?

The amount of energy saved by your school can only be determined if you have consumption data for two consecutive years. Then one can subtract the energy consumption of present year from the previous year to find the amount saved. However, there may be other factors to be considered, as well. If the strength of your school increases over the year, your energy consumption, too, will shoot up. Hence, the Green Schools audit is based on the amount of energy saved per capita, which is independent of the increase or decrease in the school's stength.

Hence, put the all the data of previous year and current year in a consolidated chart and find out the energy saved.

TABLE 6.1: Total energy and money saved by the school and points scored

Source of energy	Previous consumtion	Current consumption	Source specific Energy saved
Electricity from the board			
Petrol			
Diesel			
Kerosene			
CNG			
LPG			
Coal			
Wood			
Animal sources			
Solar			
Wind			
Total			



"90 per cent of total electricity used by a standard incandescent light bulb is wasted as heat."

$$\text{Per capita of previous year} = \frac{\text{Total energy consumption of previous year}}{\text{Total strength of previous year}} = \_\_\_\_\_$$

$$\text{Per capita of current year} = \frac{\text{Total energy consumption of current year}}{\text{Total strength of current year}} = \_\_\_\_\_$$

Turn off the lights when not in use!

ENERGY SAVED: CALCULATE YOUR POINTS

If your school uses more energy than ideal per capita consumption:

1. Per capita energy that can be saved = current per capita consumption – ideal per capita consumption

$$\frac{\text{Per capita energy saved}}{\text{Per capita energy that can be saved}} \times 100 \times .35$$

If your school uses less energy than the ideal per capita consumption:

2. Energy that can be saved = currrent per capita consumption(MJ) – 7.2(MJ)

$$\frac{\text{Per capita energy saved}}{\text{Per capita energy that can be saved}} \times 100 \times .35$$

If your school consumes less energy than 7.2 MJ per capita than your school gets full points in this section.

Note: The maximum points that can be scored for energy saved is 35.

Points scored by the school for energy saved are = _____.

TASK 5 School's initiatives

It is very important to acknowledge the initiatives taken by the management of an institution on issues related to energy. The approach of the management to issues related to energy can be assessed in the following ways:

Seek an appointment with the Chairperson, Manager and Principal of your school and ask them the questions on issues given in the table below:

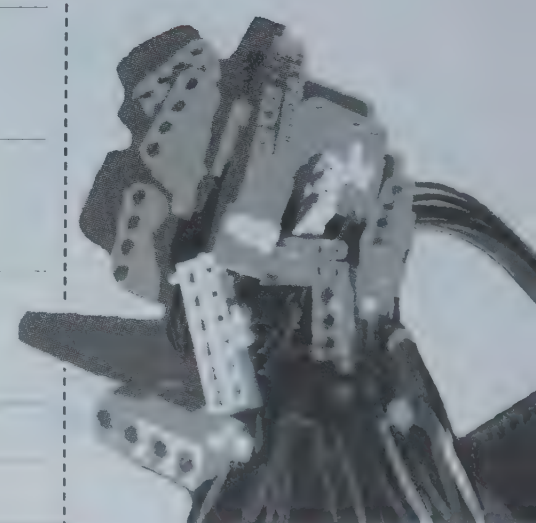
- If the answer is "Yes" give points on the basis of quality and quantity of work done. A maximum of 2.5 points can be awarded for each question.
- In case the answer is "No" give 0 points.
- Add the points to know how much your school scored.

Fill in Table 7 to explain the initiatives taken by the school management and calculate the points for this section.

TABLE 7: School's initiatives

Nature of managements intervention	Weightages	Replies	Points scored
Awareness programmes on issues of energy consumption and conservation (Mention details of programmes)	2.5 points		
Involve the students in discussing issues related to energy conservation (Mention activities conducted)	2.5 points		
Does your school have a policy on energy management for conserving energy (Attach the policy document)	2.5 points		
Implementation of any initiative	2.5 points		
Total	10		

High energy consumption and affluence go hand-in-hand. This gives the wrong message that wasteful energy consumption is a sign of wealth.

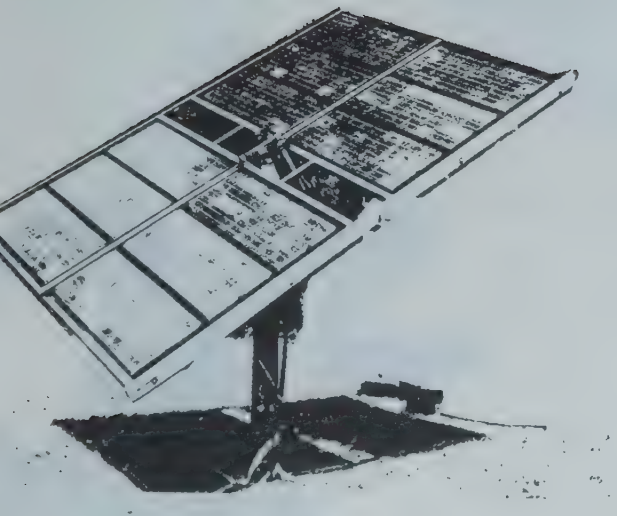


TASK 6 Energy audit

Fill in the points scored by your school in Table 8 to determine the total points scored by your school in the energy section. The teacher/team coordinator shall refer the respective tasks (shown in the table below) to note down the points.

TABLE 8: Energy, green rating chart

Category	Maximum points	Points scored
Energy consumption (Task 2)	30	
Sourcing of energy (Task 3)	15	
Best practices (Task 4)	10	
Energy saved (Task 5)	35	
School's initiatives (Task 6)	10	
Total	100	



waste

Create a waste-wise society

How much waste does your school generate?

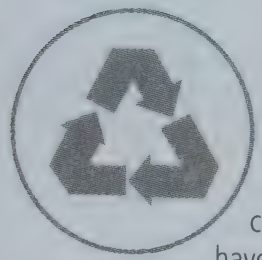
What is the waste collection system?

How much waste does your school recycle?

What is the waste disposal record of your school?

Waste worries

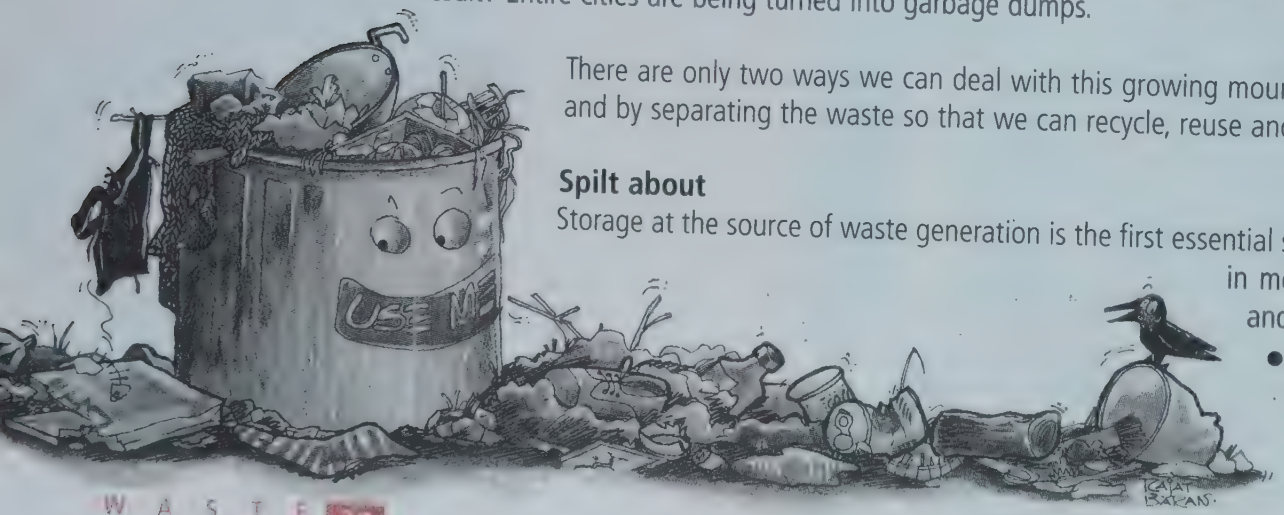
Rubbish, garbage, litter, junk, scrap, trash. Waste is generated in various forms. Managing it is one of the essential services that municipal authorities are duty-bound to provide. It appears to be a simple enough affair–putting waste into a vehicle and unloading it at a dump. But then why do so many cities and towns across the globe suffer from rotting refuse piled up in streets and drains–breeding flies and rats, and degrading urban environments?



Weighty waste

In India, waste generation ranges from 200 gms to 500 gms per capita per day in cities ranging from one lakh to over 50 lakh population. The larger the city, the higher is the per-capita waste production rate. Currently, the country generates over 40 million tonnes of waste every year. With more and more people coming to stay in towns and cities, the volume is increasing everyday. Unfortunately, the Urban Local Bodies have failed to keep pace with this growth. Most of them are cash-strapped or they do not have the technology or professional know-how required to deal with this humungous load of junk.

Result? Entire cities are being turned into garbage dumps.



There are only two ways we can deal with this growing mountain of filth: by reducing our waste by using less; and by separating the waste so that we can recycle, reuse and compost as much as possible.

Spilt about

Storage at the source of waste generation is the first essential step towards appropriate waste management. But in most urban areas existing facilities are inadequate and the practices shoddy.

- Domestic/ Trade/ Institutional waste: Most households, shops, and other establishments throw waste on the street at random hours. Those who use community dustbins provided by the local body often

throw the junk around the bin and not into it. Most of the trash remain on the roads and public spaces.

- Bio-medical waste :This contains a variety of infectious and toxic wastes generated by hospitals, nursing homes, and health care centres. It can have potent impact on human health if it is not disposed scientifically. But in most urban areas no facility exists for the safe disposal of such waste. So it gets mixed with domestic waste and is finally deposited at domestic disposal dump sites.
- Industrial Waste: Factories located within city limits produce large volumes of hazardous and non-hazardous wastes which are required to be disposed off by the industry, following standards laid down by Pollution Control Boards, at designated sites. In practice this does not happen. It gets dumped surreptitiously on open plots or on the roadside or in water bodies, causing environmental pollution and sub-soil contamination.

Recycling refuse

People do salvage re-usable or saleable material such as newspaper, glass bottles, empty tins, plastic bags, old clothes, from waste and sell it for a price. However, a lot of recyclable dry waste such as waste paper, broken glass, metal, packaging material, is not segregated and is thrown on the streets along with a mixed load of trash.

'Picking up' problems

Collection of waste is the most important component of SWM services. But it is grossly neglected in India, which continues to use primitive and inefficient systems.

There is no arrangement for house-to-house collection of waste, except in a few residential areas where private arrangements exist on payment basis. Community bins are also not available at convenient locations. In the absence of any structured system, street sweeping is the only method left for primary collection.

Rag pickers: rotten deal

In India there is a large informal sector of rag pickers who earn their livelihood from from scouring the streets, dust bins and waste dumps. It is estimated that they retrieve as much as five to ten per cent of the total waste produced in urban areas and pass it on to the recycling industries through various levels of intermediaries. In the process they lighten the burden of municipal authorities by several million rupees a year in collection, transport and disposal costs. They also help save landfill space. But they receive no kudos for their services. Nor are they offered any constructive support by the local government or the people. To add to their woe, the powerful lobby of intermediaries, which buys recyclables from the pickers for pittance (and make huge profits out of them!), tries to sabotage whatever efforts are made by citizen's groups or NGOs to organise this immensely useful workforce.

Disposal due

Open crude dumping of waste in low-lying areas is the commonest method used in the country for disposal. Some municipal authorities even dump their waste haphazardly outside their city limits or along the streets, creating heaps of waste on the roadside.

Land filling practices

In India, waste is mostly dumped without following the principles of sanitary land filling. As no segregation at source takes place, all waste, including infectious medical waste, and industrial refuse find their way to the disposal site. All are deposited

in low-lying areas, quarry pits, or roadsides and no prior testing is done to check soil permeability or lining. Waste is neither compacted nor properly covered. It remains exposed, emitting foul smell and smoke. The site breeds rats and flies and attracts stray dogs and cattle. Dump sites also endanger underground water resources as they cause subsoil water contamination.

Slums: shunned

Even though slum dwellers constitute 20 to 50 per cent of the population in a typical urban centre, waste management service offered to them by local bodies is almost nil. In most cities the SWM network does not cover slum encroachments, as municipalities are not obliged to clean private lands. So the economically weak are left to fend for themselves. Due to lack of space or any other viable alternative, people living in these hutments deposit their wastes just outside their houses. Or into storm-water drains, which are clogged with uncollected waste.

Why the mess?

Under the laws that govern the administration of Urban Local Bodies in the country, it is made obligatory for them to arrange for street sweeping and disposal of solid wastes. But there are no legal provisions to make it compulsory for Urban Local Bodies to provide community based collection; or to make it mandatory for the people to organise proper storage of waste at home.

So the SWM service has remained neglected in the country ever since Independence. It has never caught the attention of decision-makers. No wonder institutional arrangements for SWM are haphazard and ad hoc even now.

So what do we do?

There is a whole culture of waste management that needs to be put in place – from the micro-level of household and neighbourhood to the macro levels of city, state and nation.

This is possible only if waste producers – that is, all who live in cities – co-operate and participate in the waste management efforts of the local body. People do desire a better quality of life. But at the same time they ignore the facilities already provided by the urban local bodies, and litter streets, and throw waste anywhere and everywhere.

Partnering in Operation Clean-up

Collection and processing of waste need not be the exclusive domain of the local government. The order of the day is clearly a more comprehensive partnership between the community and local governments, where each waste producer has a role to play towards waste minimisation, recycling, and disposal.

Meanwhile, here are some basic practices we can begin with:

- Not throw waste on the streets, footpaths, open spaces, and water bodies;
- Store organic (food) and bio-degradable waste at source in personal domestic bins;
- Segregate or store separately recyclable and non-biodegradable waste as well as domestic hazardous waste at source;
- Provide community bins in commercial complexes;
- Deposit domestic, trade, institutional wastes in the hand carts, community bins, or vehicles provided by the local body; and
- Hospitals, nursing homes, health care establishments, industries make their own arrangements for collection, transportation and disposal of their industrial and bio-medical waste.

Mission GSP

It motivates the school community to find out what kind of waste it generates and to measure the actual volume. It also helps the school to assess its collection and disposal practices, in a bid to understand how efficiently (or ineptly) waste is being managed within the school premises. The objective is to create zero-waste zones in every school in the country.

WASTE

Schools can provide excellent educational opportunities for creating awareness about waste and its management.

- Waste reduction initiatives save natural resources, energy and landfill space.
- Reducing, reusing, recycling and waste material will improve the economic and environmental performance of the school.
- The school's waste management programme has the potential to transform the school environment into a laboratory for learning.
- It also provides numerous opportunities for the students to understand this issue and its implications on the local environment.
- The simple tasks along with the scoring system in this section will help you to map out your existing waste management practices.

TASK 1 Choose your waste audit team
TASK 2 How much waste does your school generate?
TASK 3 What is the waste collection system?
TASK 4 How much waste does your school recycle?
TASK 5 What is the waste disposal record of your school?
TASK 6 School's initiatives
TASK 7 Final score

Reduce, Reuse, Recycle and Recover.

TASK 1 Choose your waste audit team

- The house-keeping and cleaning staff of your school shall be the core members of your team, as you will have to enlist their help at every task. A teacher with interest in waste and 5 to 10 students will be ideal for your team. Administrative staff are important, as they will provide the neccessary permissions required for the house-keeping staff to work with you.

School : _____

Teacher: _____

Administrative staff: _____

Students: _____

_____ Date: _____

TASK 2 How much waste does your school generate?

There is nothing known as waste, waste is just a misplaced resource. Therefore ideally a school should not generate any waste.

TO COLLECT DATA: Arrange a meeting between the student audit team and the key people in your house-keeping staff. Let the students describe the project with them. Segregate all waste, put them in small packs and weigh using a spring balance. If the practice of segregation of waste has already been adopted, then it will be easy to find out the amount of waste paper and other common trash. For Silt and Soil – Put a small mesh wire under the dustbin. And find the amount collected beneath. Or pour the waste on a mesh, so that the dust and silt passes through and then weigh the silt.

Segregate all waste, put them in small packs and weigh using a spring balance.

Determine the quantity of waste generated in your school and fill up Table 1.

TABLE 1: Total quantity of waste generated

Type of waste	Source	Quantity (per month)
Plastic	Entire school	
Paper	Classrooms, labs, staffroom, clinic, office,library, canteen, activity rooms, art rooms	
Silt, soil, mud	Everywhere	
Food	Classrooms, staffrooms, lawns, ground, canteen, alcoves	
Horticultural waste	Lawns, ground, clay pots, planted area	
Wood, glass, metal scrap, other scrap	Everywhere	
Electronic and computer consumables	Offices, labs, classrooms, staffrooms	
Biomedical waste	Clinic or the sick room	
Others specify	Everywhere	
Total waste		

Waste generate per capita = Total waste generated/ Total strength =

SOLID WASTE GENERATED: CALCULATE YOUR POINTS

1. Ideally, the quantity of solid waste generated should not exceed 150 grams per person, per day (Day scholar school), 200 grams per person, per day (Day boarding school) and 350 grams per person, per day (Residential school).

2. If the per capita, per day waste generation in your school is equal to or less than ideal your school gets full 15 points.
3. If your school generates more than double the ideal quantity of waste it gets 0 points.
4. If the per capita, per day waste generation in your school is higher than ideal but less than the double of ideal quantity than calculate your points as given below:

$$\frac{\text{Ideal quanity of waste generation}}{\text{Waste generated per capita, per day}} \times 100 \times 0.15$$

Note: The maximum points for this section are 15.

Points for quantity of solid waste generated are = _____.

Check out the waste management cycle in the school. Ask the house-keeping staff to help you

TASK 3 What is the waste collection system?

Let's understand the waste collection system because the amount of waste recycled or reused will depend on the method of collection. To understand the waste collection system of your school fill up section 1 and 2.

TO COLLECT DATA: The students will have to count the number of waste disposal points in the school with one dustbin and two dustbins (one for biodegradable and the other for non-biodegradable) physically. They will have to survey the waste collection area and talk to the house-keeping staff to know whether waste is segregated in the school and in what quantity.

In section 1 put a tick mark against the correct option.

Section 1: Waste collection system		
Is waste collected in categories of biodegradable and non-biodegradable?	Yes	No

Find out the total number of collection points and the number of collection points with two bins and enter the values in section 2 below.

Section 2: Waste collection points	
Number of waste collection points	
Number of waste collection points with two bins	

Go around the school and count the number of dustbins

SOLID WASTE COLLECTION: CALCULATE YOUR POINTS

1. If your school segregates waste both at source and maintains the segregation during and after collection it scores full 15 points.

2. If there is no segregation of solid waste at any level the score is 0.

3. If there is segregation of waste at source, that is, there are two waste collection bins at all waste collection points (one for biodegradable waste and one for non-biodegradable waste) then your school scores 10 points.

To calculate score on 10 points:

4. In case the school does not have two containers at all waste collection points, the points scored can be determined as follows:
   a) First determine the percentage of waste collection points which have two containers by applying the formula:

$$\frac{\text{Number of waste collection points with two bins}}{\text{Total number of waste collection points}} \times 100 = a \text{.....(Percentage of waste collection points with two bins)}$$

   b) Points scored by the school are:

$$\frac{\text{10 (points for waste collection)}}{100} \times a$$

To calculate score on remaining 5 points:

5. If there is no segregation of waste at source but the staff segregates waste into biodegradable and non-biodegradable then your school scores 5 points.

6. In case your school segregates waste at source but does not maintain the segregation during and after collection it scores 0 point.

SEGREGATE

Collect waste in separate bins for biodegradable and non-biodegradable varieties. This makes disposal and recycling easier

The points scored for collection of waste are = _____ .

TASK 4 How much waste does your school recycle?

COLLECTING DATA: Find out whether the school has any waste recycling facility like compost pit, paper recycling machine. Ascertain the quantity of waste recycled by weighing total waste generated in a particular category from the quantity of waste recycled. If you have a paper recyling unit, the person incharge will definitely be recordig the input and output from the unit. If the school is selling newspapers or bottles or metal scrap to the local waste dealer (*kabadiwala*), that can also be included in the quantity recycled.

Apply the weightages given in table 4.2 of the waste chapter and procedure given in calculate your points box below the table to find out your points.

Does your school encourage students to reuse text books?

Considerable area of forest is lost every year in India to produce text books used by students in schools. You can contribute to forest conservation by buying second hand text books. This will cut down the total number printed.

TO COLLECT DATA: Conduct a survey to find out how many students in the school are using second hand text books. Class monitors can be given the responsibility to carry it out in each section. Once you add up the total number you can calculate the points scored for reuse of text books by using the formula given below:

$$\frac{\text{Number of students using second hand text books}}{\text{Total number of students in your school}} \times 100 \times .05$$

Add the points scored in this section to those scored in recycling of other materials in the next section.

Section 1: Composting facility

Does the school have a composting facility? If 'Yes' then mention the type (pressure or worms). If 'No' then describe why not? Describe the location, specify the capacity of the facilities and mention who operates the system. Is the facility used as a tool for education? If 'Yes' mention for which grades, if 'No' then why not?

Textbook production on a mass scale by itself drains our forest resources. Encouraging students to share and recycle, so that a school can make do with as few copies as possible, is of vital importance.

Vermicomposting

Composting organic or biodegradable waste is the best and easiest way to convert waste into useful manure. Composted waste or vermicompost is like "baby food" for plants because it has readily available nutrients which plants can use.

Section 2: Paper recycling or/and reuse

Does the school have a paper recycling or/and reuse facility?
If 'Yes' mention the capacity of the paper recycling or/and reuse system, if 'No' then state why not.
Describe the location and mention who operates the systems. Are the facilities used as a tool for education? If 'Yes' mention for which grades, if 'No' then explain why not?

Did you know?

A 1.2 km stretch road was built near Kancheepuram in Tamil Nadu using plastic waste blended with bitumen and rock aggregate. Plastic increases bonding and makes the roads survive the monsoons better.

Section 3: Waste generated and reused/recycled

In this section

- First fill in table 4.1. to know the total quality of waste generated and the quantity reused/recycled.
- Calculate the percentage for each type of waste reused/recycled by following the method given after table 4.1
- Calculate the points scored in this section and enter the results in table 4.2. (To calculate the points refer to the weightage chart)

Table 4.1: Quantity of waste generated and reused/recycled monthly

Type of waste	Total quantity of waste generated	Quantity reused and/or recycled	Percentage	Points
Plastic				
Paper				
Silt, Soil, Mud, etc.				
Food				
Horticultural waste				
Wood, Glass, Metal scrap, other scrap, etc.				
Electronic and computer consumables				
Biomedical waste				
Others specify				
Total waste				

Table 4.2: Total points for Reuse and/or Recycle

Solid waste – Reuse and Recycling weightages

Type of waste	Weightage	Points scored
Plastic	5.0	
Paper	5.0	
Silt, soil, mud etc.	5.0	
Food	5.0	
Horticultural waste	5.0	
Wood, glass, metal scrap, other scrap	5.0	
Electronic and computer consumables	5.0	
Biomedical waste	0	
Others specify	0	
Total points	35	

REUSE AND RECYCLE: CALCULATE YOUR POINTS

1. Reuse and recycling of solid waste carries 35 points.
2. Determine the points scored in this section by:

   a) $$\frac{\text{Quantity of type of solid waste reused, recycled}}{\text{Total quantity of that type of waste}} \times 100 = a \ldots \text{(Percentage of the type of solid waste reused, recycled)}$$

   b) Calculate points scored by applying the formula:

   $$\frac{\text{Weightage allotted to each type of waste (refer weightage chart)}}{100} \times a$$

3. Write the points scored by the school for reuse or/and recycling of each specific type of waste in the Table 4.2 and add them to get the total points scored in this section. Add to that the points scored in the text book section.

Points scored for reuse and recycling of waste are = _____ .

THE BENEFITS

Reducing, reusing, recycling and recovering waste materials

- Saves waste disposal costs
- Efficient energy use results in savings
- Extra material is made available through reuse policy

Recycling schemes

- Financial revenue earned for each tonne recycled
- Decrease in wastage
- Saves on cost of purchasing materials

Including issues related to waste in the curriculum

- Helps school community to understand issues related to waste
- Raises awareness about impact of waste on environment

TASK 5 What is the waste disposal record of the school?

COLLECTING DATA: The house-keeping staff with the help of students should weigh the waste being disposed outside the school in each category mentioned in table 5.2 of the waste chapter. All the weightages except biomedical and electronic waste carry negative points.

- First fill in Table 5.1 to know the annual quantity of solid waste. (see box: Collecting data on left)
- Calculate the percentage for each type of solid waste disposed, by following the method given after 5.1
- Calculate the points scored in this section and enter the results in Table 5.2. Refer to the weightage chart to calculate the points.

Table 5.1: Total solid waste disposed by the school in sanitary landfill

Type of waste	Total quantity of waste generated	Quantity reused and/or recycled	Percentage	Points
Plastic				
Wood, glass, metal scrap, other scrap				
Electronic and computer consumables				
Biomedical waste				
Others (specify)				
Total waste				

The disposal of waste in the sanitary landfill must be reduced to the minimum possible.

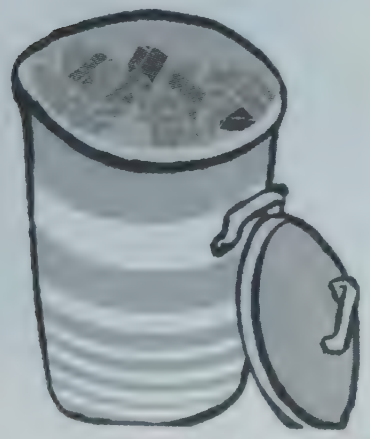


Table 5.2: Solid waste — Total points for disposal of solid waste

Type of waste	Weightage	Points scored
Plastic	-8	
Wood, glass, metal scrap, other scrap	-8	
Electronic and computer consumables	8	
Biomedical waste	8	
Others specify	4	
Total points	20	

SOLID WASTE DISPOSAL: CALCULATE YOUR POINTS

1. Solid waste disposal carries 20 points. No points for disposal of waste in non-sanitary landfill.
2. To determine the percentage for each type of solid waste disposed, apply the formula given below:

a) $$\frac{\text{Quantity of type of solid waste being disposed in sanitary landfill}}{\text{Total quantity of that type of waste generated}} \times 100 = a \ldots \text{(Percentage of the type of solid waste disposed)}$$

b) To calculate the points for this task apply the formula:

$$\frac{\text{Weightage allotted to each type of waste (refer to table 5.2)}}{100} \times a$$

3. Write the points scored by the school for disposal of each specific type of waste in Table 5.2, subtract the negative points from the positive points to get the total points scored in this task.
4. For medical waste — disposal in sanitary landfill after autoclaving or any other disinfecting technique.

Points scored for disposal of waste are = _____ .

TASK 6 School's initiatives

It is important to appreciate the initiatives taken by the management on issues related to waste. The management's approach to these issues can be assessed in the following way:

Seek an appointment with the Chairperson, Manager and Principal of your school and ask them the questions on issues given in the table 6.

- If the answer is "Yes" give points on the basis of quality and quantity of work done. A maximum of 2.5 points can be awarded for each question.
- In case the answer is "No" give 0 points.
- Add the points to know how much your school scored.

Fill in Table 6 on the next page to explain the initiatives taken by the school management on issues related to waste and calculate the points for this section.

Table 6: School's initiatives

Nature of management's intervention	Weightages	Response	Points scored
1. Conduct regular awareness programmes on issues related to solid waste? (Mention details of the programmes)	2.5 points		
2. Involve the students so that they understand the issues related to solid waste? (Mention special activities conducted)	2.5 points		
3. Does the school have a policy on waste? (Attach the policy document)	2.5 points		
4. Does the school have a separate environment teacher?	2.5 points		
Total	10 points		

The more you recycle the more you score. The less you dispose, the more you score. The more you score, the more you gain.

TASK 7 Final score

Well now you won't just dump it and forget, would you? We are sure you won't. Not after all this hard work! Remember that nothing is waste. It is only our attitude that makes us waste what can be used. So let's now find out the final result. Fill up the table below and get the overall picture of waste management in your school.

Table 7: Where does your school stand?

Category	Maximum points	Points scored
Quantity of solid waste produced	15	
Solid waste collection	15	
Reuse and Recycling of solid waste	40	
Solid waste disposal	20	
School's initiatives	10	
Total	100	

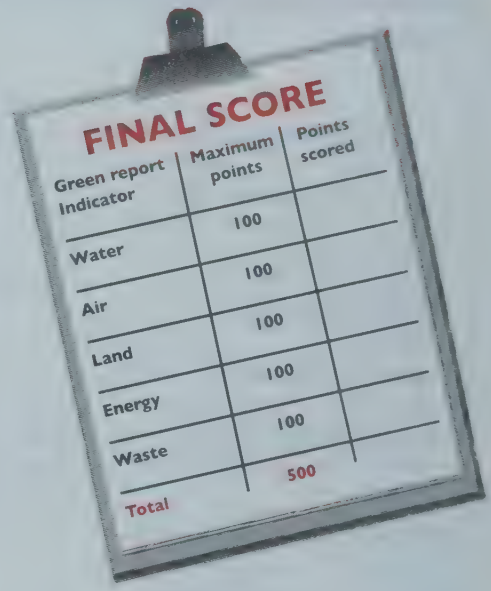
THE GREEN SCHOOL REPORT CARD

This is a self-assessment report card. Compile the results of your assessment so that we can judge where your school stands on the green index. **To find out the rating of your school:**

$$\frac{\text{Total points scored by your school (See the green rating chart)}}{\text{Maximum points that can be scored (See the green rating chart)}} \times 100 = \text{Percentage scored.}$$

Tick the category your school falls into by comparing the percentage scored with the percentage chart given below:

AWARDS		
Above 80%	5 Leaves Award	
70 to 79.9%	4 Leaves Award	
60 to 69.9%	3 Leaves Award	
50 to 59.9%	2 Leaves Award	
40 to 49.9.9%	1 Leaf Award	
Less than 40%	No Award	



Final score: Water

Indicator	Maximum points	Points scored
Task 2: Water consumption	15	
Task 3: Sanitation facilities	15	
Task 4: Water conservation practices	10	
Task 5: Rainwater harvesting	25	
Task 6: Reuse/Recycling	25	
Task 7: School's Initiatives	10	
Total	100	

Final score: Air

Indicator	Maximum points	Points scored
Task 2: Oxygen Balance	10	
Task 3: Air pollution levels	Urban 10 / Rural 0	
Task 4: RSPM	Urban 0 / 10 Rural	
Task 5: School vehicles	25	
Task 5: Commuting practices	30	
Task 5: Ventilation in rooms	15	
Task 6: School's Initiatives	10	
Total	100	

Final score: Land

Indicator	Maximum points	Points scored
Task 2: Percentage of green area	10	
Task 3: Tree canopy area	10	
Task 4: Land use	10	
Task 4: Biodiversity	40	
Task 4: Pesticide use	20	
Task 5: School's Initiatives	10	
Total	100	

Final score: Energy

Indicator	Maximum points	Points scored
Task 2: Energy consumption	30	
Task 3: Sourcing of energy	15	
Task 4: Best practices	10	
Task 5: Energy saved	35	
Task 6: School's Initiatives	10	
Total	100	

Final score: Waste

Indicator	Maximum points	Points scored
Task 2: Quantity of solid waste produced	15	
Task 3: Solid waste collection	15	
Task 4: Reuse and Recycling of solid waste	40	
Task 5: Solid waste disposal	20	
Task 6: School's Initiatives	10	
Total	100	

Final score

Green report Indicator	Maximum points	Points scored
Water	100	
Air	100	
Land	100	
Energy	100	
Waste	100	
Total	500	

Understanding the Green Schools Report

What does your report card say?

Compare the marks scored by your school in each and every task of the five chapters. Mark the area where your school has scored less and above average points. The tasks (indicators) in which it has scored poorly are the areas of resource management your school needs to focus on and improve its performance.

Form a discussion group to rationalise why you have scored less than average in certain tasks and what can the school do about improving its points in the identified areas.

For example a school scores poorly in commuting practices task (Air Chapter). The apparent reason is that a majority of the students travel to school in personal vehicles. Therefore, to increase points, your school needs to start a campaign to motivate the school community to decide in favour of commuting by public/mass transport so that the school can improve its green performance next year. Now analyse your report and write, in the space given below, the remedial measures you will propose to the school authorities in each chapter.

Water_____

_____

Air_____

_____

Land_____

_____

Energy _____

_____

Waste _____

_____

Document audit teams recomendations and present them to the school's Principal for further action.

Document your recommendations and present it to the school's Principal

Your Green Certificate

School Name: _____

Final score: _____

Principal's Name: _____

Coordinating Teacher's Name: _____

Contact Address: _____

_____

Telephone: _____ *Fax:* _____

Email: _____

Date: _____ *Stamp:* _____

_____

Coordinating agency

Suggested activities

The Green Schools Programme is not an isolated project, only to be handled by the eco-club members of the school. It is a project for the entire school community. The Green Schools Audit Team can engage in a host of activities to disseminate the information collected, and encourage environmental audits at different places:

What can you do in the school:

After the Green Schools audit is complete and the team has analysed the report, share it with the entire school. While you can formally make a presentation at the school assembly, there are a host of informal ways in making the school community aware about your findings.

- Put a board alongside the oldest tree of your school, so that everybody can identify it.
- Put pictures of the plants and animals you have listed in your biodiversity inventory on the Eco-Club notice board.
- Share the commuter audit with your school and start a campaign for shunning private vehicles and using public transport.
- Post copies of the school electricity bills near every switchboard.

Think of more innovative ways of sharing the audit information with the school community.

What can you do personally? Do a home audit

You can do a similar 'Green Home Audit' at home. The procedure is the same – calculate water consumption and look at your electricty bill. Find out how many cylinders of gas you use every month. You may also find out how much rainwater you can harvest at home.

Involve your elder brother or sister in the process of data collection and calculations. It will be fun to create a Green Home Report Card for your family.

What can you do with community? Scale up the audit

The basic principles of the Green Schools audit can be applied to audit any institution within a boundary. So, the same principles can be applied to college or club compounds.

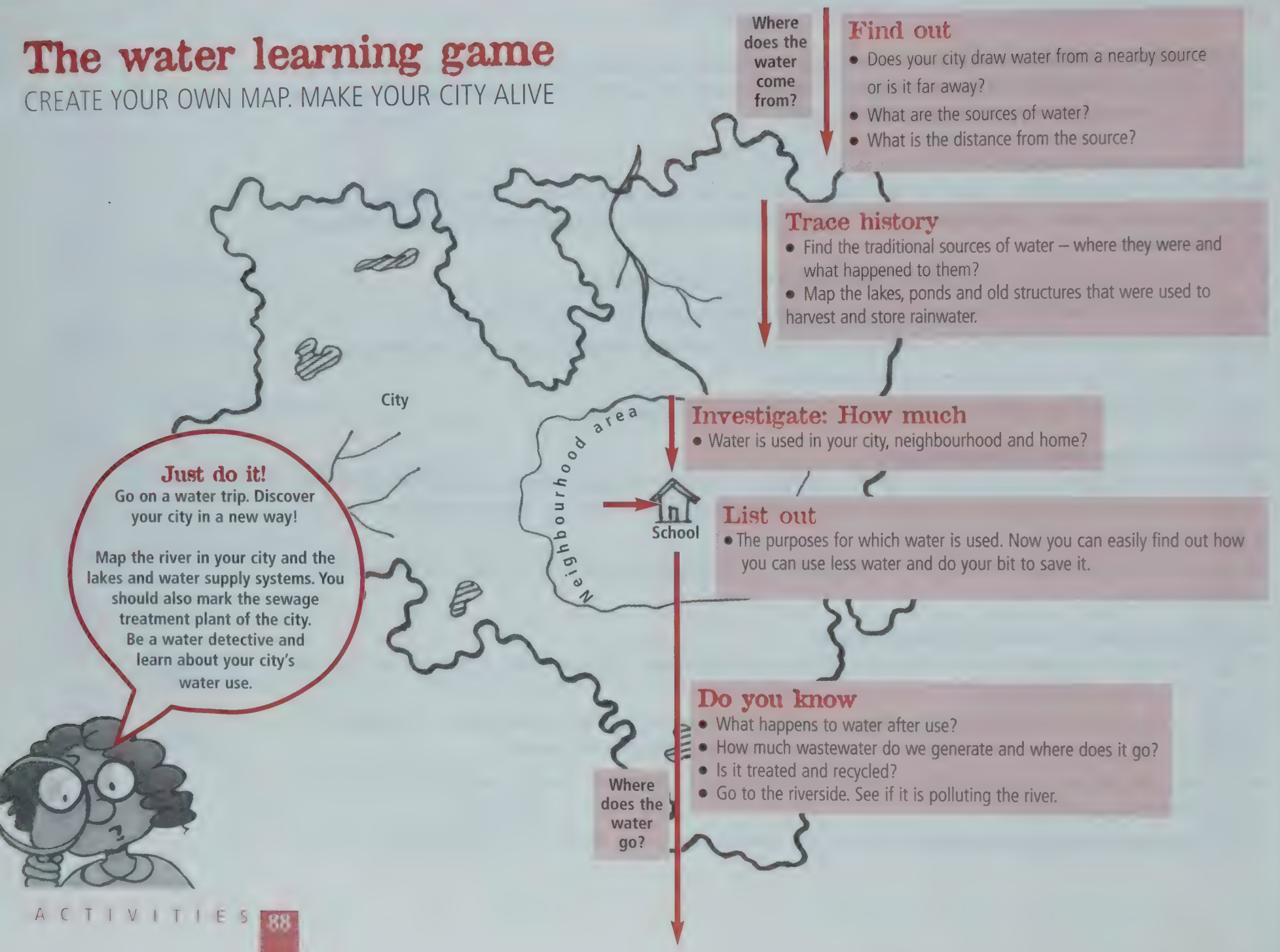
The same principles can be applied to do an environmental audit in the community. Find out your colony's or village's water consumption. But you will have to enlist help from a larger group of people in executing such an audit.

Many more audits and activities can be generated out of the audit process. Do let us know how you went about it at the address given on the back of the manual.

Meanwhile, enjoy doing the activities given in the next few pages – How to make a water map and how to conduct vermicomposting.

The water learning game

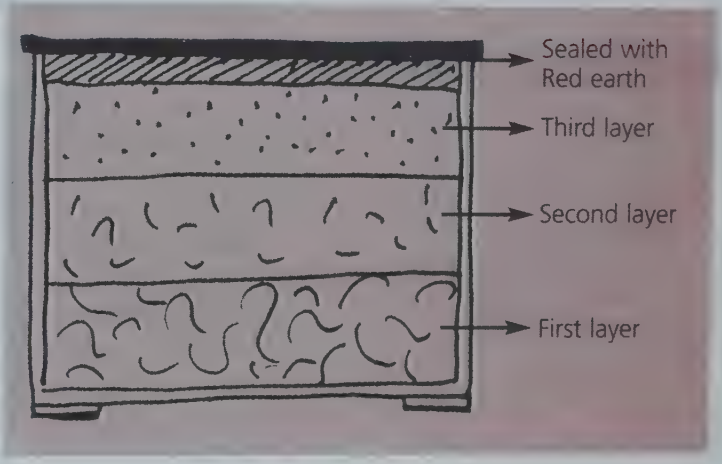
CREATE YOUR OWN MAP. MAKE YOUR CITY ALIVE


Where does the water come from?
Find out
• Does your city draw water from a nearby source or is it far away?
• What are the sources of water?
• What is the distance from the source?
Trace history
• Find the traditional sources of water – where they were and what happened to them?
• Map the lakes, ponds and old structures that were used to harvest and store rainwater.
City
Neighbourhood area
School
Investigate: How much
• Water is used in your city, neighbourhood and home?
List out
• The purposes for which water is used. Now you can easily find out how you can use less water and do your bit to save it.
Just do it!
Go on a water trip. Discover your city in a new way!
Map the river in your city and the lakes and water supply systems. You should also mark the sewage treatment plant of the city. Be a water detective and learn about your city's water use.
Do you know
• What happens to water after use?
• How much wastewater do we generate and where does it go?
• Is it treated and recycled?
• Go to the riverside. See if it is polluting the river.
Where does the water go?

Vermicomposting

Earthworms are the farmers best friends. They convert organic waste into rich manure for all plants. Vermicompost is like 'babyfood' — readily available nutrients for plants. After 45 days, one kg of adult worms can turn 100 kgs of organic materials into 50-60 kgs of rich vermicompost. Vermi extracts and wash act as great tonics for plants. Aerobic decomposition of household and garden litter can easily be composted. You can do it in a drum, gunnybags or plastic containers. You will need a 8 centimetres (wide) X 8 centimetres (high) X 8 centimetres (long) container.

Place 25 grams of worms after 12 days of daily watering. Seal the container with red earth. Apply on top a thin swathe of gobar (cowdung) slurry. Sprinkle water each day. Leave it sealed for 90-100 days.



Ingredients:

Beverages, kitchen rinse water: For moistening the pile's middle. Do not overdo it.

Cardboard: It increases the carbon content. Shred into small pieces if you use it. Wetting it makes it easier to tear. If you have a lot, consider recycling instead.

Coffee ground and filters: Increases the nitrogen content. Worms love it.

Eggshells: Break down slowly. Crushing shells helps.

Hair: It increases the nitrogen content. Scatter so it is not in clumps.

Manure (excreta of horse, cow, pig, sheep, goat, chicken, rabbit): Great source of nitrogen. Mix with carbon rich materials so it breaks down better.

Newspaper: It increases the carbon content. Shred it so it breaks down easier. Do not add slick coloured pages.

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Waste

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Abbreviations

CSE	Centre for Science and Environment
LPD	Litres per day
LPCD	Litres per capita per day
LPY	Litres per year
LW	Litres of water
NAAQS	National Ambient Air Quality Standards
CO	Carbon Monoxide
SOx	Oxides of Sulphur
NOx	Oxides of Nitrogen
VOCs	Volatile Organic Compounds
mg/m3	Milligrammes per cubic metre
NPP	Net primary production
Kwh	Kilowatt hour
MJ	Mega Joules
Kg	Kilogramme
Ltr	Litre
KVA	Kilo volt ampere
HP	Horse Power
mt	Metric tonnes
bcum	Billion cubic metres
TWH	Tera watt hour
sqmt	Square metre

Feedback Form

1. Did you find the manual relevant?

2. Was the process user-friendly?

3. Write your suggestions on each of the following sections to help us improve this manual.

Water:

Air:

Land:

Energy:

Waste:

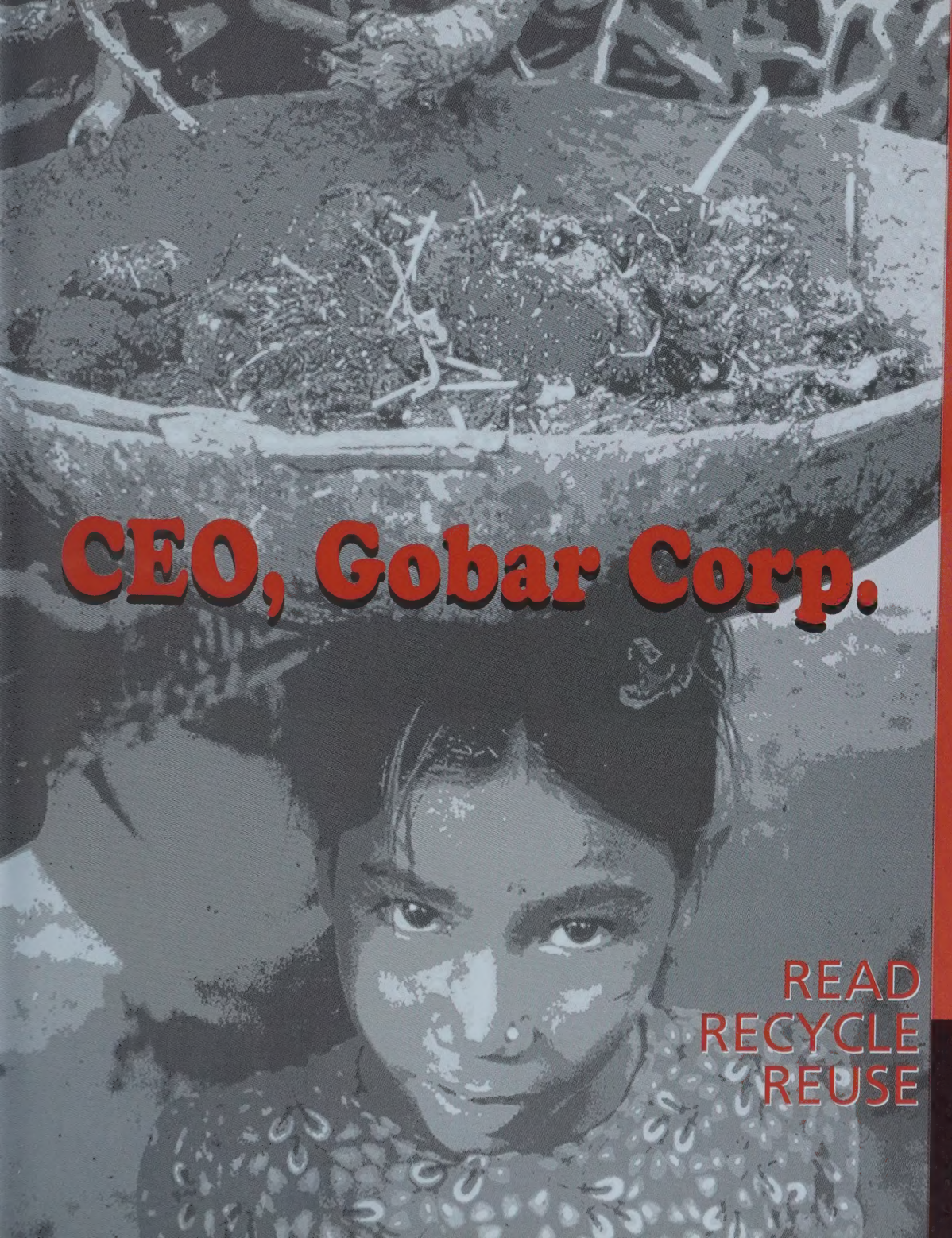
4. Has the manual helped your school? If so, how?

Teacher's Signature

Principal's Signature

Date

Tear here



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SELF-ANALYSIS is a great way to learn. The Centre for Science and Environment (CSE) has applied this idea to environment education. Sharply different from the usual song and dance one sees in the name of environment in many schools, this contest (*Green Schools Programme*) impelled children and their teachers to analyse the school's own track record and to improve it....

Few though they are, CSE's green schools offer a modicum of hope in a schizophrenic landscape. The idea of self-audit has the potential to make environment-related learning a means of gluing back together the fragmented school curriculum. It also promises to instil mindfulness in human relations with nature and thereby materialise a dynamic kind of value-education.

Professor Krishna Kumar
Director,
National Council of Education Research and Training (NCERT)

The Centre for Science and Environment (CSE) is a public interest research and advocacy organisation based in New Delhi. The Centre researches into, lobbies for and communicates the urgency of development that is both sustainable and equitable.

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